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The effect of iron nanoparticles and feeding time on weight and pH of broiler breast muscle

Abbasinezhad M. and A.A.Saki

***Abstract*—**160 Ross broilers were assigned randomly to 4 groups. First and second groups were fed with basal diet twice: first, immediately after delivery to rearing farm, and second, 18 hours post hatch; third and fourth group were fed twice with a diet containing 0.002g/Kg. iron nanoparticles, first immediately after delivery to rearing farm, and second, 18 hours post hatch. We found that in both feeding times chickens fed with diet containing iron nanoparticles had significantly higher weight compared to chickens fed with basal diet. No significant difference was also found between chicken breast pH in all diet groups.

***Keywords*—** early feeding, iron nanoparticles, breast muscle, broiler chicks, pH

I. INTRODUCTION

Iron deficiency is a common nutritional deficiency around the world (24). A strategy to cope with this problem is adding iron supplements to feedstuff. Iron is required in the body for hemoglobin and myoglobin synthesis (15, 16), for cell growth and differentiation (1). It is also an essential part of structure of many proteins and enzymes (25). Iron deficiency impairs the delivery of oxygen to cells, thus affecting the immunity performance (5). The iron taken into body is coupled with transferrin as ferric iron in serosa surface. Ferritin is the major form of iron storage in the body (26).

Biotechnology as the most advanced branch of science has found applications in all animal and plant life, and also found venues in environmental and industrial applications, opening new horizons in natural sciences. With change in size from micrometers to nanometers, and resulting greater surface area to volume ratio, physical and chemical properties, including particles chemical and biological activity are changed drastically. Today, development of industrial application of nanoparticles has provided them with an opportunity to be incorporated as food additives. However, little research has focused on the examination of nanoparticles in poultry nutrition. Iron nanoparticles would find potential applications in medical and biological research due to physical and chemical properties as a result of greater surface area to volume ratio (7, 20).

On the other hand, understanding of the mechanism of muscle growth has important implications for agricultural sector. Muscle is the main source of food. The poultry industry has been focusing on maximizing the carcass growth especially breast muscle, which is the most valuable part of the carcass (28). In poultry industry first few weeks of the chickens' lives are crucial. From a nutritional point of view, amino acids, carbohydrates, vitamins, minerals, enzymes, and cofactors are important to boost the proliferation of lymphocytes and immunity factors (12, 13). Post hatch muscle growth happens through elongation of myogenic fibres during the sudden growth of satellite nuclei of the cells (28).

In practical settings, chicks find access to food 36 to 48 hours post hatch, during which they lose body weight and their muscle and intestine growth and developments is hampered. To deal with these limitations, regular feeding of the chicks according to embryonic feeding arrangements and provision of water and feed for newly hatched chicks would prove effective. Broilers' weight triples or quadruples in the first week, which accounts for increasing growth of intestine, muscle weight, and morphology (9). Each gram increase in weight up to d7 is equal to 5 gram increase in weight in d49 (15). Thus, depriving chicks of feed in early days would end up in decreased body's ultimate weight (11).

With extensive application of iron oxide nanoparticles in different biological strands, little research has been conducted about the effect of iron nanoparticles and its unique properties on oxygen delivery to breast muscles, development, and growth of breast muscles in broilers. The present study examines the effect of iron nanoparticles and feeding time on performance and pH of breast muscle in broilers.

2. HYPOTHESIS AND REVIEW OF LITERATURE

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Some research has examined the effect of iron nanoparticles on productivity and development of tissues in mouse embryo (18). Researchers examined iron nanoparticles as feed additive in poultry feed (17) and found no toxic effect of iron nanoparticles on birds. Research has indicated that iron nanoparticles has effects on production performance in agriculture and animal farming (14).

Chicks hatch with a yolk sac which accounts for 20 per cent of its body weight. Yolk sac contains significant amount of proteins and lipid, which provides the chicks with 50 per cent of energy and 43 per cent of protein needs during few hours post hatch. The nutritional material of yolk sac are depleted rapidly, and it is totally absorbed into the body by third day posthatch. The level of intestinal TG as the only source of energy for chicks in posthatch period is insufficient; thus access to feed for chicks is crucial to their growth (19). Research has indicated that access to feed accelerated the absorption into the body of yolk sac. In a study of chicks food-deprived during past 48 hours, they lost 7.8 per cent of their body weight, and depletion of protein and lipid in tissues was more evident than that of other compounds; however, chicks that had access to feed and water, gained 500g more ultimate body weight in comparison. Ideally, chicks should find access to water and feed within 8 hours post hatch. Two days of feed-deprivation post hatch would cause poor satellite cell proliferation in *major pectoralis* (2, 6). Feed-depriving in total period when there is an increased expression of genes sequencing Insulin-like growth factor 1 (IGF-1) and myostatin in skeletal muscle poses a major impediment on muscle growth (4). Development of skeletal muscle is a result of proliferation and differentiation of myoblast which integrates into multinucleated myotubes. Myotubes also differentiate into muscle fibres. Skeletal muscle growth in post hatch period depends on formation and differentiation of satellite cells (28). Research has reported that immediate post hatch feeding increases the breast muscle weight when slaughtering (10).

3. MATERIALS AND METHODS

Iron nanoparticles were synthesized according to method described in (8). To ensure that our particles is truly nanosized, we used X-ray diffraction (Fig1), giving us 8-12nm as iron nanoparticle diameter. To determine size and morphology of iron nanoparticles we used a Philips EM 208 transmission electron microscope operating at 100 KeV (Kafa Laboratories) (Fig 2).

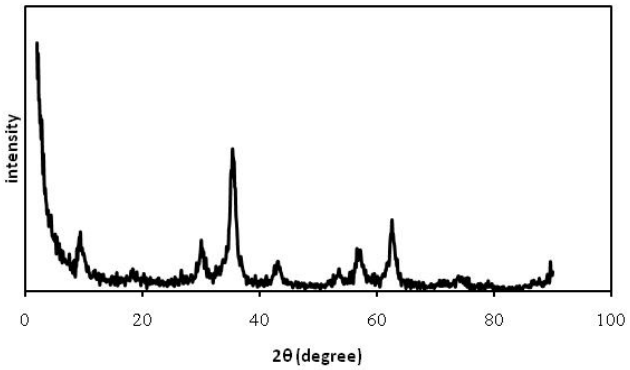

Fig1. XRD of iron nano particles

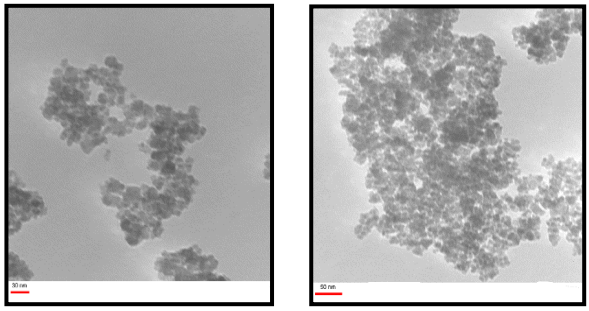

Fig2. TEM of iron nano particles

160 Ross broilers were assigned in a completely randomized factorial design to 4 treatments, with 4 replicates in each treatment. First and second groups were fed with basal diet twice: first, immediately after delivery to rearing farm, and second, 18 hours post hatch; third and fourth group were fed twice with a diet containing 0.002g/Kg. iron nanoparticle, first immediately after delivery to rearing farm, and second, 18 hours post hatch. The basal diet composition for total period and protein-to-energy ratio according to Ross nutritional requirements (Table 1). In 21 and 42 days, a chicken from each replicate was randomly. Then, we determined carcass weight and the percentage of breast-to-carcass weight ratio. Length, width (in three parts) and depth of the breast muscle was measured in millimetres. The pH in breast muscle sample was measured according to method described in (3) 24 hours after slaughter. The data was fed into SAS 9.1 (21) and analysed through general linear models (GLM).

4. RESULTS AND DISCUSSION

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As seen in Tables 2 and 3, in both periods, feeding chicks with iron nanoparticles increased the percentage of breast muscle weight. The same trend is also observed in mutual effect of feeding time and iron nanoparticles in the diet. In d21, the breast height in chicks fed with iron nanoparticles and delay in feeding was significantly more than that in chicks fed with basal diet ($P<0.05$). There was no significant difference in breast muscle pH in all periods.

Table 3 shows that breast muscle width increased significantly in chicks fed immediately after delivery to rearing farm compared to that in feed-deprived chicks ($P<0.05$). Breast muscle length in 42d was significantly more in chicks fed with iron nanoparticles ($P<0.05$).

As research on the effect of trace minerals including iron indicated, supplementation of copper, iron, zinc, and manganese in diets based on soybean and corn improved the breast meat quality and the water holding capacity of breast and thigh muscles (29). The only study conducted using iron nanoparticles in the diet (17) found that iron nanoparticles had no toxic effect on broilers, but had a positive effect on blood parameters. Sue et al. (22, 23) reported improvements in meat quality and broiler performance when inorganic iron was introduced into the broiler diets.

Table 1. Rations ingredient and calculated nutritional levels in treatments

Ingredient (%)	Starter (1-10 d)	Grower (11-24d)	Finisher (25-42d)
Corn	56	56	64.42
Soybean meal	36.25	32.84	23
Corn gloton	1	3.06	4.86
Soybean oil	2.5	4.62	3.21
Mono calcium phosphate	1.50	1.52	1.50
Limestone	1.58	1.46	1.39
Salt	0.35	0.38	0.37
Vitamin - mineral supplement [A]	0.5	0.5	0.5
DL- methionine	0.2	0.29	0.35
Lysine	0.12	0.33	0.4
Total (%)	100	100	100
ME(kcal/kg)	3025	3150	3200
Nutrient calculated			
CP (%)	22	21.8	19
Ca (%)	1.05	0.9	0.85
Available P (%)	0.44	0.45	0.5
Met and Cys (%)	0.85	0.95	0.86
Iron (mg/kg)	80	80	80

Each kilogram of vitamin-mineral supplement contains; Mn 120 mg; Fe 40 mg; Zn 100 mg; Cu 16 mg; I 1.25 mg; Se 0.3 mg. Vitamin A, 12000IU; vitamin D_3, 5000 IU; vitamin E, 75 mg; vitamin K3, 3 mg; vitamin B_1, 3 mg; vitamin B_2, 8 mg; vitamin $B_3$15 mg; vitamin B_5, 60 mg; vitamin B6, 2mg; vitamin B_9, 2 mg; vitamin B12 , 16µg; biotin, 200 µg; choline chloride, 500 mg.

5. CONCLUSIONS AND SUGGESTIONS

Our findings indicated that iron nanoparticles increased the percentage of breast muscle weight in broilers. Further research however is recommended on the effect of other levels of iron nanoparticles in the diet and its possible interactions with other trace minerals in order to provide better recommendations on the use of iron nanoparticles in broiler diet.

6. ACKNOWLEDGMENT

We specially thank Bu-Ali Sina University for providing the facilities and the financial support in this study. We also thank the staff of the Department of Animal Science and Faculty of Chemistry in this university for their excellent scientific collaboration.

Table2. Measured parameters in breast muscle broiler chickens at 21 days of age.

effects	(%)	(mm)			
	Weight	Lenght	Width	Hight	pH
Immediately feeding (6h)	22.85	111.5	76.6	45.4	6.01
delay in feeding (18h)	22.55	111.9	77.3	48.6	5.54
P-value	0.9	0.8	0.06	0.46	0.68
basal diet	20.56^{b}	108.8	79.3	42.5^{b}	6.07
Iron nanoparticles (INP)	24.84^{a}	114.6	74.6	51.5^{a}	5.48
p-value	<0.00001	0.06	0.07	<0.00001	0.35
feeding (6h) with basal diet	20.49^{b}	110.0	81.1	42.5^{c}	6.02
feeding (18h) with basal diet	20.63^{b}	117.5	77.5	42.5^{c}	6.13
feeding (6h) with (INP)	25.22^{a}	113.0	72.1	48.3^{b}	6.01
feeding (18h) with (INP)	24.47^{a}	116.3	71.0	54.3^{a}	4.95
SEM	0.74	0.62	1.98	2.36	2.83
p-value interaction	0.56	0.33	0.1	0.06	0.36
p-value treatment	0.0008	0.2	0.11	0.0004	0.52

Means with common superscripts in same column are not significantly different. ($P < 0.05$). SEM: standard error of the means.

Table3. Measured parameters in breast muscle broiler chickens at 42 days of age.

effects	(%)	(mm)			
	Weight	Lenght	Width	Hight	pH
Immediately feeding (6h)	24.83	176.9	130.2^{a}	81.6	6.53
delay in feeding (18h)	24.00	182.3	119.7^{b}	77.4	6.42
P-value	0.19	0.11	0.02	0.44	0.83
basal diet	23.19^{b}	175.4^{b}	127.1	76.6	6.45
Iron nanoparticles (INP)	25.64^{a}	185.8^{a}	122.8	51.5^{a}	6.50
p-value	0.001	0.02	0.31	0.56	0.62
feeding (6h) with basal diet	23.59^{bc}	171.3^{b}	133.6	78.3	6.51
feeding (18h) with basal diet	22.80^{c}	179.5^{ab}	120.6	75.0	6.39

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feeding (6h) with (INP)	26.08[a]	182.4[a]	126.9	85.0	6.55
feeding (18h) with (INP)	25.21[ab]	185.0[a]	118.8	79.8	6.45
SEM	0.59	3.15	3.98	2.67	0.22
p-value interaction	0.96	0.38	0.55	0.89	0.97
p-value treatment	0.008	0.04	0.08	0.8	0.96

Means with common superscripts in same column are not significantly different. (P < 0.05). SEM: standard error of the means.

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Analysis the effect of trees and fruit plants as urban green walls, on increasing sustainable natural resources

Mohamad Moayedi

Abstract- According to increasing development and challenges of city lives, conserving the environment is essential more than before. Hence, sustainability and sustainable development arise to save urban habitats from industry and technology and to save and develop natural resources as a factor in planning agenda. Considering city parks, land occupation to greeneries and so on are considered in this approach. Although there are tensions here: green and open spaces do not lead to direct benefits so, there is a little financial support behind them. But there is strong willing to find new solutions about urban greeneries development in developed countries because of commitments over agreements and ecologic charters and also, public force. There for, one of the predicted solutions is taking benefit from urban green walls and roofs. Using these walls as modern urban development strategy to conserve city environment, decrease pollution and energy consumption optimizing is discussed. Besides having environmental benefits, they lead to sustainable aestheticy in urban landscape. This thesis, besides studying concepts like sustainability, sustainable development and green wall, analyze the role of urban green roofs and walls in city stabilization by analytic-descriptive method and library studies. In last, necessity of survey becomes clear and suggestions are presented. In general, studies show that paying attention to urban green walls, specially ignored spaces, has a significant effect on urban ecology and pollution decrease. Plants as natural filters, increase livability rate of cities.

Key words- green crust, sustainability, sustainable city, urban ecology, urban public space, wall.

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1. INTRODUCTION

According to increasing development and challenges of city lives, conserving the environment is essential more than before. Although there are tensions here: green and open spaces do not lead to direct benefits so, there is a little financial support behind them. Local and government investments are focused on plans with short term benefits in which land is served to gain short term financial benefits(Armaqan,1389). . But there is strong willing to find new solutions about urban greeneries development in developed countries because of commitments over agreements and ecologic charters and also, public force(Tajbakhsh,1378,84). One of these solutions is urban green walls and roofs. This thesis, besides studying concepts like sustainability, sustainable development and green wall, analyze the role of urban green roofs and walls in city stabilization by analytic-descriptive method and library studies.

II. THEORY

A. Sustainable development:

City as an ecologic unit has precise connection between human and environment inside it, in which this connection is affected by time and place as in communities with environmental and technologic constraints, nature wins human and vise versa. Although in an ideal community, relation between nature and environment should be in a way that no one win the other which is considered by sustainable development(Movahed,1379,43). Human life sustainability is threatened by some factors today: technology change, economic activity, population growth and severe environmental and social change. Urban sustainability has allocated a vast part of urban researches to itself in recent years in which there should be logical relationship between environment and socio-economic factors(Hosseinzadeh,1371). Perhaps the most comprehensive description upon this subject has been presented by World Commission on Environment and Development, known as Brunt Land: Sustainable development meets present needs without wasting abilities and potentials of future generation(Houghtin,1997,115). So in this model each generation is apt to have the same amount of natural capital, as the others have had(Sarafi,1375,39). Generally, principles of Sustainable development are as below:

1. Conserving the environment with attention to ecosystem tolerances,
2. Decreasing environmental pollutions(Azizi,1385,37),
3. Minimizing energy consumption,
4. Biodiversity enhancement in and about cities(Biddulph,2007).

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So, referring to Sustainable development definition, qualitative characteristics like perspective, heritage, convenience, safety, health and desirable life are under consideration. Sustainable development aim is conserving general characteristics and quality of the environment in which socio-economic subjects are necessary to be considered. Lloyd notes mutual impressions of socio-economic and environmental processes, as a complete system, have been neglected. To evaluate sustainability, city should be seen as a whole and all subjects need to be mentioned(Baron et al,1379,17). This kind of development means: agglomeration and landuse change to meet people basic needs and make city a livable place ecologically, sustainable economically and equal socially, in which technologic changes lead to entrepreneurship, housing supply and proper ecology(Maleki,1382,34).

B. Sustainable city, Green city:

According to previous studying a green city is a city in which citizens feel responsible over the environment and in association with civil and governmental organizations make a healthy, calm and vital environment. In this city green space per person and visual and sound pollution are optimized while wastage per person is minimum because of proper recycling(separation from origin). Energy and material consumption is also optimized, about global standards. With attention to green city components, urban greeneries are double important because they balance city metabolisms, also increase aestheticy and quality. They are also affective in balance temperature, increasing relative humidity, subtilizing the weather, absorbing dust(Rezvani,1381). An active green space is designed fit to urban ecology(Shokouyi,1382).

C. Urban green crusts:

City is mixture of different parts. Roofs, green spaces and decorations are main parts. Each of them has its own features and causes thermal balance. Because of economic issues In crowded cities, most commercial zones are allocated to roofs and decorations(as path, street, side walk) while greeneries are less considered. Using usual materials and popular methods in these city structures have led to being of main absorbing and reflecting solar energy sources. Hence, new materials and methods cause less heat absorption by decorations(Berdhal,P.and.S.Bretz,1997,149). These walls and roofs besides decreasing the temperature, affect the environment seriously. One of these materials is planting on roofs and walls which is colloquially known as green crust. Green crust refers to every hard surface on which plants are able to grow. It divides to green wall and green roof which have their own subdivision as well(Soflayi,1385,56). Reaching to sustainability goals by these surfaces is directly dependant on planning and programming(Velazquez,2005).

D. Green roof:

Cities are 25% consisted of roofs which are good potentials for activities. Specially Iran with hot and dry climate in which most houses have no gable roofs, green roofs are able to compensate missing greeneries and lead to sustainability and environmental quality(Saeidi Rezvani,1391,20). Green roof also called "plant roof" and "ecologic roof", is a light architectural system which enables plants to grow on roof while protecting it. This roof is actually a live surface of plants in a thin or thick layer of soil on a covering layer. The cover is some time a roof protector layer and a drainage layer in which drought resistant plant species grow(Soflayi,1385). Parks were replaced by green roofs as gardens in developed and populated cities because of increasing constructions but decreasing lands. This technology can be considered of most significant positive changes in cities: increasing green space per person, environmental quality and sustainable development(Armaqan,1389). According to history, the idea of roof gardens were first used by Iranians about 2500 years ago on the roof of Ziggurat. After that, on 600 B.C Babylonians got inspired from Iranians. Hanging gardens of Babylon can also be mentioned here. In 14th and 15th century(renaissance and medieval era) these gardens were made in France and Italy by the government, public buildings(Gorse,1983). Early 20th can be known as starting a new flow of functional roofs and terrace. The idea of using green roofs formed by Le Corbusier and Frank Lloyd Wright. Although none of them had attitude about environmental, social and economic benefits of green crusts. In those days, green roof was differently used(parks and greeneries organization of Tehran manucipality,1389). Today, green roof is an executive agenda in constructing buildings in urban planning of most cities. With attention to this fact that roofs include high percentage of city area, increasing land price and lack of greeneries within cities, especially in CBDs, this solution can be considered as an efficient way of using lands.

E. Benefits of green roofs for urban stabilizing:

Urban green spaces are strong tools to improve cities environment besides, according to close relations between people and these spaces, they lead to peace, comfort and identity. Aestheticy, cleanness, integration and titivation as most important factors of a healthy, green and sustainable city, are presented in them. At last, they cause people participation in conserving urban environment. Most important benefits of green roofs are presented in Table1 and their effect on sustainable designing is considered in Table2.

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Table(1): Benefits of green roofs, regarding to sustainability components

Sustainability components	**Benefits**
Ecologic	- Improving air quality - Decrease in sound pollution - Decrease in electromagnetic rays - Decrease in cold wind effect and insulation - Exchanging O_2 with CO_2 - Cool down the weather - Balance heat island effect - Conserving biodiversity and creating habitat - Improving ecologic quality of city
Economic	- Decrease the expenditure of artificial ventilation - Decrease unsustainable energies consumption - Increase longevity of the roof operation
Social and cultural	- Increase sense of attachment to the place - Increase peace - Increase social relationships area - Amenities - Identity
Physical	- Improving landscape - Enhancement of building facades - Remove pollutions - Aesthetics - Visual serenity

Table(2): Green roof effect on sustainable designing

Sustainable development components	**Effect on sustainable designing**	**Effect on green roof system**
Economic sustainability	Conserving current economic situation without destroying natural resources	Green roof related to special economic goals
Social sustainability	- Importance of human and society - Social integration and participation	- Qualified environment for individual life - Place making for social connections of building dwellers - Designing with attention to Iranian culture

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	- Cultural identity	
Ecologic sustainability	- Decrease natural resources and unsustainable energies consumption - No energy wastage - Decrease wastage production with the emphasize on recycling - Decrease pollutions	- Energy economy(heat, cold, drainage) - Sound insulation - Air and water purification and dust absorption

F. Types of green roofs:

They divide in three categories that is presented in Table3.

Table(3): Types of green roofs

Type	**Specifications**	**Type of plants**	**Definitions**
Extensive green roof	1 to 15 Inches soil layer	Plants with shallow roots like grass	No reformation is needed
Intensive green roof	Minimum 1 foot soil layer	Trees, bushes, other landscaping plants	Serious conservation is needed. Building needs more bearing capacity for extra weight.
Synthetic green roof	Mixture of intensive and extensive roofs	Both mentioned traits	Building needs more bearing capacity for extra weight.

G. Pros and cons of green roofs:

Pros and cons of green roofs are presented in Table(4).

Table(4): Pros and cons of intensive and extensive green roof system

	Extensive green roof	**Intensive green roof**
Characteristics	Thin soil, no detailed watering, standing difficult situations	Thick soil, watering system, proper conditions for plants
Pros	- Light weight - Suitable for large areas - Suitable for roofs with 30 degree gradient - Minimum conservation - No watering - Relatively cheap	- Biodiversity - Proper insulation - The ability to simulate zoo - High attractiveness - Flexibility in usage

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Cons	- Limitation in choosing plants - Not using for amenities - Not attractive for some ones in winter	- Heavy weight on roof - Drainage, watering and energy are needed - High cost - Complex system and skills are needed.

H. Urban green walls:

Term "green wall" or "green partition" or "vertical gardens" is a live global covering system with the same benefits as green roofs. It is a modern technology which has found its real place in metropolitans. Green wall refers to an independent structure or part of a building which is covered by plants. This system is in order to meet the objectives of sustainable development while obeying its components as well. They save private and public sector expenditures(Madan doost,1390,5). A live green wall is a vertical combination of plants which omits toxic substances and unsafe pollutants from the air we breathe. naturally(Torkjezi,1391,3). Most live green walls are interior but they may also be used outside the building. Today green walls are specially designed by a supportive structure which cause energy consumption economy, psychological benefits, amenities, preventing green house gases and heat islands, climate quality improvement, making habitats for creatures, food supply, entrepreneurship, aesthetics(Building design and construction). Green walls decrease the temperature and thermal insulation of walls is caused by them. Decrease of solar energy absorbance and reflected ray from streets and buildings, cause heat islands to become balanced(Building design and construction).

I. Sustainability dimensions in green walls:

Table5 presents benefits of green walls, regarding to sustainability.

Table(5): Sustainability dimensions of green walls

Sustainability dimensions	**Traits**
Social	- Decorating urban spaces - Vitality and exhilaration - Diversity - Qualified landscape - Physical and mental health of individuals
Economic	- Conserving walls - Low cost of decorating walls - Heat insulation and energy saving - Modern technology and decrease in water consumption - Entrepreneurship
Ecologic	- Increasing greeneries - Conserving current plants - Lower contaminations - Decrease sound pollution - Decrease green house gasses - Balance heat island with lowering the temperature - Decrease energy consumption - Qualified ecology - Conserving ecology and bio diversity

Table(6): Benefits of urban green walls

Area	**Affected zone**	**Description**	**Effects**

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Urban environment	Decrease of heat island effect	Temperature in cities stars to increase because of paving, buildings and Other structures. Sun light turns into heat. Plants can cool down the environment by shadow, humidity and Oxygen making.	- Accelerating cool the temperature down - Making shadow - Decrease wind speed
	Increase of greeneries	One of the components of urban sustainability is greenery per person. Green walls increase the amount of this component.	- Increasing greeneries - Reaching sustainability
	Conservation of city structures and walls	Buildings and walls are damaged by the passage of time because of sun light and climate change. Numerous expansion and contraction in different seasons and spot light accelerate this vulnerability.	- Conserving building walls against climate change and pollutants
	Air quality improvement	Green walls are capable to absorb dust as a filter. So filtration and air purification is easily done.	- Dust, CO_2 and lead absorption
	Increase of urban aesthetics	Green walls increase aesthetics while attaching to artificial environment.	- Place attachment - Viability, exhilaration and peace in urban spaces - Hiding visual undesirability - Symbols and signs
	Decrease of energy consumption	Green walls as natural insulators, prevent confrontation of outer temperature and walls. They also decrease energy consumption by absorbing dust and producing Oxygen.	- Decrease heat exchange - Decrease the temperature by shadow - Heat and cold insulator

J. Types of green walls:

There are two main categories:

1. Green facades:

It is a kind of green wall in which a simple structure in form of a scaffold is attached to the wall and act as a base for decummbents and climbing plants(ivy, grapevine). In this system, plant moves on facade. It spins and climbs the structure while the root is in a layer of soil(Saeidi Rezvani,1391,20).Green facades are able to lean to front walls, columns and palisades, or be constructed as an independent structure. This technique has low risk and price and implementation is easier. Regarding to period of plant growth(about 3 to 5 years in this technique), stratified flower boxes are suitable.

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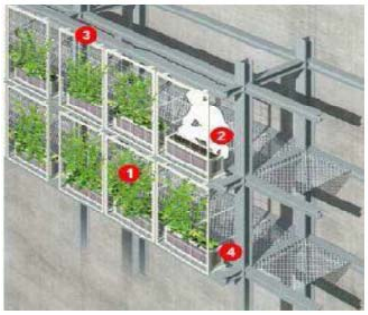

Fig(1): Climbing plants

2. Live walls:

Oxygen maker wall is consisted of pre-coated panels with plants or vertical modulus which are cinched to walls. These walls divide in two categories: active and deactivated systems(Saeidi Rezvani,1391,20). Live wall is more complex and more expensive than green facade, also needs watering and fertilizing(Green wall executive agenda). Plant wall of Patrick Blanc and landscaping green wall can be mentioned here which are complex administratively. Landscaping green walls are mostly used that can be seen on bridge walls, highways and building walls.

Fig(2): Samples of landscaping green walls

K. Pros and cons of green walls:

Table7 presents pros and cons of discussed techniques.

Table(7): Pros and cons of green façade and live wall:

	Green facade	**Live walls**
Characteristics	Supportive structures, plant root in land or stratified flower boxes	Independent structure, pre-coated panels with plants
Pros	- Low temperature in and about the building - Aesthetic and visual potentials - Minimum air and sound pollution and greenhouse gasses - Minimum energy consumption - Long lasting building crust - Low cost - Low risk - Easy implementation - Stratified flower boxes - Easy watering	- Low temperature in and about the building - Aesthetic and visual potentials - Minimum air and sound pollution and greenhouse gasses - Minimum energy consumption - Long lasting building crust - Bio diversity - Flexible with different climates - Fast outcomes
Cons	- Limitation in choosing plants - Supportive structure is needed - Long period of plant growth	- More conserving is needed - High cost - Complex implementation - Drainage, watering and energy are needed

III. CONCLUSION

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Paying attention to city ecology that leads to livability, requires sustainable planning and designing in construction and development. The result will be conserving natural resources, environmental quality and meeting future needs. Hence, green life besides aesthetics, leads to less dust and chemical contamination, air pollution, temperature balance, increasing humidity and purring the air. There for, a serious relationship between natural and human-made environment is required. Efficient utilization of green crusts, especially on roofs and walls as inutile spaces, is an effective step toward urban sustainability. Green roofs and walls multiply visual aesthetics as well. The most important benefits of green roofs are briefly as: control and decrease energy consumption, air purification and act as an insulator. Most effective roles of green walls(specially in highways) are: increase aesthetics, lower ray and light reflection, decrease air and sound pollutions, balance the temperature and so on. Hence, it is essential to consider potentials, capacities and constraints of these techniques and plan for localization to reach sustainable cities.

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Assessment of site and damage incurred in natural and planted stands of *Haloxylon persicum* in Abbas Abad region, Miami County (Semnan province)

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***Abstract*—** Haloxylon plants are leafless shrubs with an articulated stem that were planted to stabilize moving sands as well as to green desert but they became gradually wilted and declined. Few studies have been done on damage incurred and resistance of natural and planted stands of Haloxylon. The aims of this study are to identify pests of Haloxylon shrub and their effects on this species as well as to compare natural and planted stands of Haloxylon in Abbas-Abad region of Miami County. In each stand a 1ha plot was selected randomly and parameters including density, number of main branches, individual height, collar diameter, canopy area, seeding rate, regenerations, seed conditions, vitality, and amount of damage incurred by pests were measured and evaluated. To identify pests, regular visits were made throughout the year and live traps, dead traps and mesh-fabric traps were used to capture pests. Results showed that in natural stand density (307 individual per hectare) and canopy area (2965.27 m^2 ha^{-1}) were higher than planted stand. In planted stand, amount of seed production (79% of individuals), number of regenerations (1239 individual per hectare), percentage of healthy seeds (72.75%), and vitality (61%) were higher than natural stand. In natural stand 52% of individuals were completely infected by pest but for planted stand this value was 88% representing higher resistance of natural stand to pest compared to planted one. Pests *Caillardia azurea* Log., *Acanthococcus abaii* Danzig., *Eriophyes sp*, and *Allactaya elater* Lich., were identified, and the highest damage in both stands had caused by pest *Caillardia azurea* Log.

***Keywords*—** natural Haloylon stand, planted stand, pest, Haloxylon, vitality.

I. Introduction

APPROXIMATELY 89.7% of the country area is poorly vegetated. Since 1959, xerophyte plants particularly Haloxylon species were planted for increasing vegetation cover, avoiding desertification, protecting cities, villages and road lines, and desired result was achieved. Five Haloxylon species are present in Iran [3]:
H. ammodendron، *H. aphyllum*، *H. recurvum*، *H. salicornicum*، *Haloxylon persicum*

Haloxylon are leafless trees or shrubs with articulated stems. Haloxylon leaves change their form during the growing season and become a part of the tree branches; some of the leaves are detached from tree and fall when facing cold. So far, costly projects have been implemented in order to prevent the advance of the desert and moving-sand but no serious and practical measures to control pests and diseases in Haloxylon plantations have been implemented. Regarding the pest density and lack of management and natural control of pest it has gradually eliminated Haloxylon plantations and the vitality of plants, seed production has been reduced or in some cases seeds produced have poor (or no) viability. Declining phenomenon that has been emerged in recent years in some planted stands of Haloxylon necessitates understanding the biology and ecology of this valuable species. The purpose of this research is to identify pests' type, population, and their impact on healthiness, vitality and regeneration of natural and planted *Haloxylon* stands as well as to compare between natural and planted habitats of *H. persicum* in Abbas Abad district of Miami located at Semnan province.

II. Theory and Literature Review

After about 6 years since planting the planted *Haloxylon* stands (1972) signs of wilting and drying in individuals was observed that caused some concerns about these plantations [1]. Due to the expansion of wilting to most plantations, researchers began to investigate the possible role of pests and diseases, drought, humidity, density, abundance of minerals, salt, water and soil physical quality. Damage incurred by pest is considered one of the most important factors of damage and some pests have been identified so far [7]. Abaei and Adeli during a period of 5 years (since 1984) identified the pests and harmful rodents of *Haloxylon* plantations. Soil chemical and physical relationships with the vitality of natural and planted

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stands of Haloxylon in southern Khorasan province were examined and it was concluded that organic matter, carbon, nitrogen and moisture content in natural populations have caused increased vitality than planted *Haloxylon* stands [9] and the reduced regeneration in some natural stands is due to the soil salinity caused by falling leaves containing solute and salt. In another study of natural and planted *Haloxylon* stands in Sistan, it was observed that amount of EC, organic carbon and plant diversity in natural stands is more than planted stands [4]. In a study conducted in planted forests of Yazd it was became clear that one of the effective ways of rejuvenating Haloxylon shrubs is cutting individuals at a height of 35 cm. More than 25 species of pests were identified for genus Haloxylon [8], the most important pests are: Dericorys Albidula, *Acanthococcus abaii* Danzig., *Haplothrips kermanensis Zur Str*., *Eriophyes sp*, *Caillardia azurea* Log., seed-eater mouths, aphid, and Types of rats. Given that genus Haloxylon is limited to few countries, so little research on the extent of damage and resistance of natural and planted stands to pests has been carried out.

III. MATERIAL AND METHODS

The study area is located at Abbas Abad region of Miami at the east part of Semnan province. A natural stand of Haloxylon is located at region called Goud-Taghy and a planted one is placed in 20 km west of natural stand near the Jahanabad village. Being middle-aged, the planted stand aged 23 years, in contrast natural stand had more than 25 years and so was an old-aged stand [5].

Here are the most important species in the study area:

Acanthophyllum heratense, ygophyllum euryterum, Salsola sp., Haloxylon persicum, Pteropyrum aucher, Artemisia sieber, Seidltzia rosmarinus, Atraphaxis spinosa.

The average altitude (above sea level) in natural stand and planted one were 890 m and 1012 m, respectively. Mean annual precipitation in natural and planted stands were 137 and 131.7 mm respectively; in natural stand drought period extended from early April to November months but in planted stand it prolonged from May to November months. Soil in natural stand was classified as Aridisols with pH value 8.04 but in planted stand soil was classified as Aridisols and Entisols with pH values 8.16 and 8.28, respectively. In each stand, a one-hectare plot was selected randomly to pick data. Throughout the year, regularly visits (from spring to winter) were performed to identify pests and collect data. To capture the pests live traps, dead traps and mesh-fabric traps were used. Mesh- fabric was placed around *Haloxylon* reproductive spikes to collect pests such as seed-eater moths (september to December). Measurements in individuals were carried out in summer especially September month. The required parameters like collar diameter, individual height, number of main branches, two main diameters of canopy, vitality, number of rat holes, seeding rate and the number of regenerations in stand were measured and counted. Damage intensity incurred by pests was assessed at each individual.

IV. RESULTS AND DISCUSSION

Density: results showed that density in Haloxylon natural stand and planted stand is 307 ha and 217 individual per hectare, respectively, that is an appropriate density. High groundwater level could be one reason for the high density of stand.

Number of branches: Haloxylon species usually does not have a single trunk and represents multiple branching, so we counted the number of branches in each individual and to further assessment, branches were divided into 5 groups. 41% of individuals in natural stand had 4 main branches, but in planted stand trees and shrubs having 1 and 3 branches (each with 29%) were the most frequent individuals and the lowest frequency of individuals was belonged to 1-branch individuals (4%) in natural stands; individuals with 5- branches and more (8%) as well as 4-branches individuals (8%) were the least frequent ones (figure 1). The results showed that individuals with main branches in natural stand were more than the planted stand, and this could indicate the power of sprouting and site fertility.

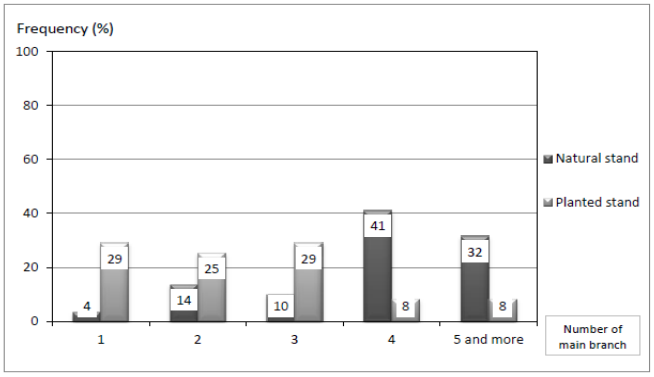

Figure 1: comparison of percentage of individuals between natural vs. planted stand *H.persicum* in terms of branches

Height: in assessment of height and length of branches it was clear that the average length of branch in natural and planted stand were 1.32 and 1.66 m, respectively. Branch height was classified to 8 classes (with interval 0.5 m). Class with the most frequent individuals in both stands was class 1-m (0.5-1m) and the percentages in natural and planted stand were 35% and 37%, respectively (figure 2). Increased average height in planted stand can be due to excessive grazing pressure is in this stand.

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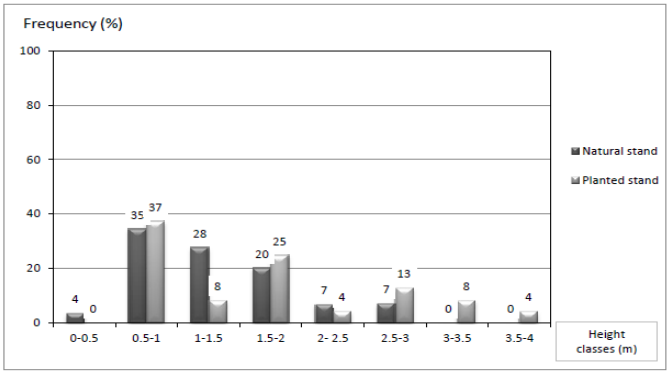

Figure 2: comparison of percentage of individuals between natural vs. planted stand *H.persicum* in terms of different height classes.

Collar diameter: individuals with the highest diameter in natural and planted stand had 15.3 and 30.5 cm diameters, respectively. Average collar diameters in in natural and planted stand were 6.12 and 8.44 cm, respectively. Diameter class of less than 5 cm had the highest frequency of individuals in both stands (figure 3). The low value of individual diameter in natural stand could be due to genetic characteristics of species and site conditions (productivity) and perhaps this can be due to tolerance in harsh dessert conditions.

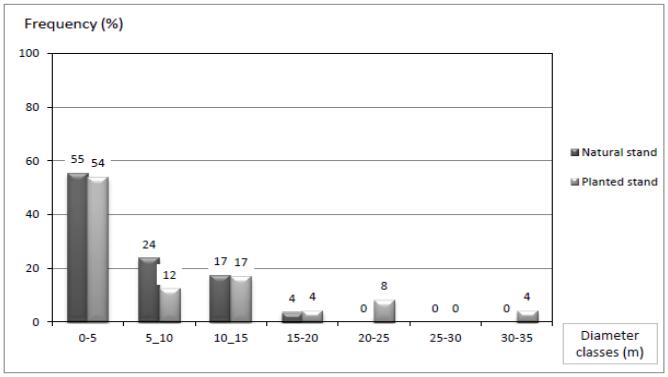

Figure 3: comparison of percentage of individuals between natural vs. planted stand H.persicum in different diameter classes.

Canopy: canopy conditions in terms of quantity and healthiness is one of the most important criteria for evaluating sites. In selected plots, canopy area in natural and planted stands were estimated 2965.27 and 1976.02 m^2 ha^-, respectively. Average crown area in individuals in natural and planted stands were 9.66 and 9.11 m^2, respectively that represent the better condition of natural stand. This has been demonstrated in some researches [6]. In this investigation, individuals were classified in 5 classes (with interval 10 m^2) in terms of crown areas and in this regard the two stand were compared; 65% and 58% of individuals in natural and planted stands, respectively, occurred in class 1 (less than 10 m^2 area) (figure 4).

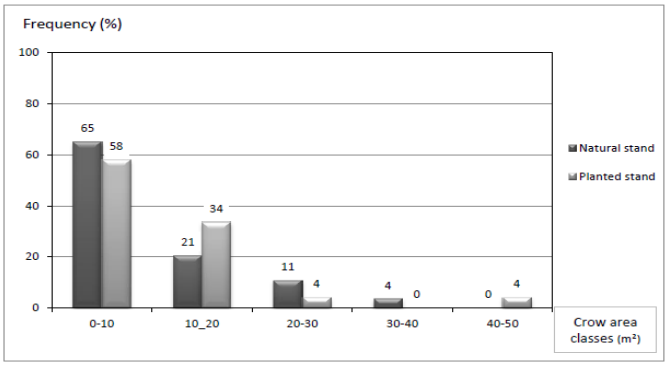

Figure 4: comparison of percentage of individuals between natural vs. planted stand *H.persicum* in different classes of crown area.

Seed production: to assess seed production, individuals were classified in 3 classes namely high seed production, low seed production and no-seed production classes. 79% of individuals did not bear any seed, but in planted stand 79% of individuals produced high amount of seed (figure 5). Low seed production in natural stand could be due to individual aging.

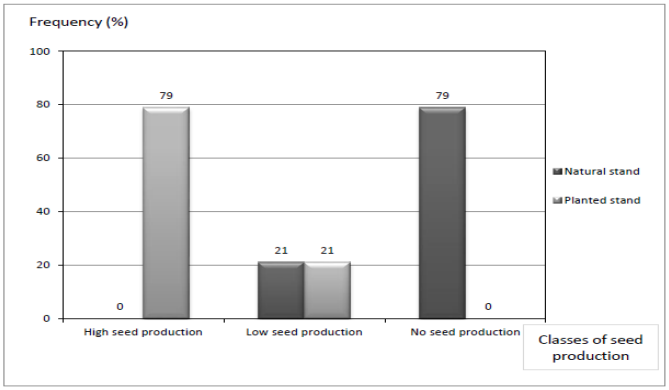

Figure 5: comparison of percentage of individuals between natural vs. planted stand *H.persicum* in terms of different classes of seed production.

Regeneration: The results of counting regeneration showed that in natural and planted *Haloxylon* stands there was 318 trees and 1,239 regenerations per ha, respectively. Regeneration in planted stand was about 4 fold greater than natural stand in the study area. Being old-aged and the process of shedding leaves containing mineral and salt in natural stand caused increased soil salinity and thereby lack of regeneration in this stand [10].

Seed conditions: In order to assess the health status of the seeds on the trees a number 20 white mesh fabric was placed around the reproductive shoots from late summer until December month (in a such way that any pest could not enter them) then seed were collected and counted. Only 4.58% of seeds in natural stand were healthy and remaining ones were unhealthy but in planted stand healthy seeds represented

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72.75% of all seeds collected so there was a significant difference between the two stand (table 1). This indicates the appropriate conditions of *Haloxylon* planted site.

Table 1. Status of collected seeds in natural and planted *H.pesicum* stands.

Stand type	Total number of	Number of healthy seeds	Percentage of healthy seeds	number of unhealthy seeds	Percentage of unhealthy seeds
natural	۱۵۳	۷	۴/۵۸	۱۴۶	۹۵/۴۲
planted	۳۸۹	۲۸۳	۷۲/۷۵	۱۰۶	۲۷/۲۵

Vitality: vitality of individuals in the two regions was examined and the average vitality of *Haloxylon* in natural and planted stands was estimated 59% and 61%, respectively. Vitality of the trees was examined in 10 classes. Vitality of most individuals in natural stand corresponded with classes 5-8 (between 40-80%), but in planted stand the vitality was placed in classes 4-7 (between 30-70%) (figure6). In addition to stand origin, proper vitality in natural stand was due to improved ecological conditions in the region.

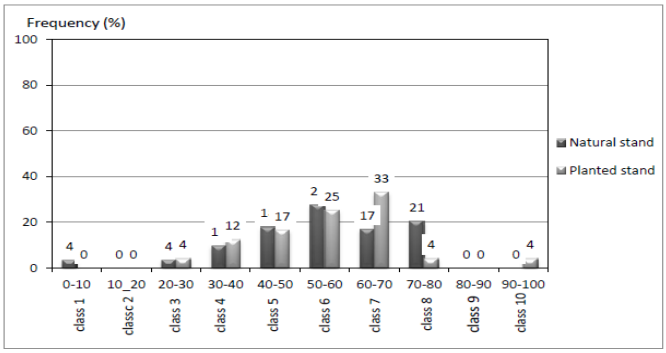

Figure 6: comparison of percentage of individuals between natural vs. planted stand *H.persicum* in terms of vitality classes.

Pests: by regular visits and applying live trap and dead traps and for trapping rodents as well as mesh fabric that was wrapped around *Haloxylon* reproductive spikes for a period of four months (September to December), four pest species were observed and identified: *Caillardia azurea* Log., *Acanthococcus abaii* Danzig., *Eriophyes sp*, and *Allactaya elater* Lich. Common pests of both natural and planted stands of were *Caillardia azurea* Log. and *Allactaya elater* Lich. *Eriophyes sp* pest was only found in natural stand but *Acanthococcus abaii* Danzig was only belonged to planted stand. Results showed that the type of pest and the damage incurred correlated with stand and site conditions in addition to tree or shrub species.

Percentage of infected individuals in natural and planted stands was estimated to be 97% and 96%, respectively. In natural stand, 52% of individuals had been completely infected by pests but in planted stand this value was 88%. The results showed that natural stand have shown more resistance against pests compared to planted one (figure 6). 79% of individuals in natural stand and 96% of them in planted stand were infected by (*Caillardia azurea* Log).

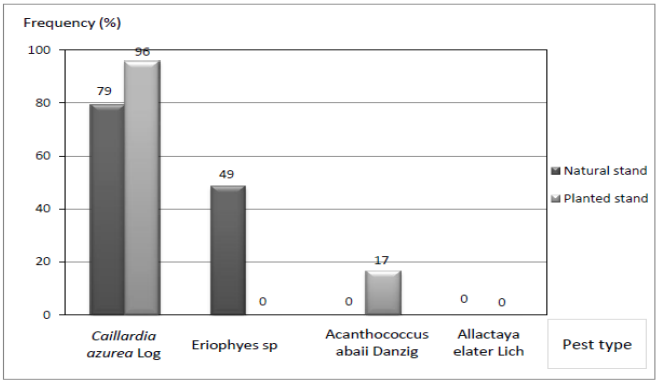

Figure 7. Comparison of number of individuals in natural and planted stand of *H.persicum* infected by the pests (separately for each pest).

V. CONCLUSION AND SUGGESTIONS

According to the survey, density of natural stand (307 individuals per ha) was higher than planted one and it can be due to high groundwater level (about 7 to 12 m) in the region. Results showed that *Haloxylon* individuals grow in group and in a shrub form and resistance to habitat conditions increase with increased sprouting. Since the individuals of natural stands have higher number of main branch, they represent less collar diameter. Crown area in natural stand normal population (27/2965 m^2 ha^{-1}) is in good condition, which suggests the possibility of developing its margin. Considering the conducted assessment 79% of individuals in natural stand produced no seed, it could be suggested that aging in this stand has caused decrease in seed production of individuals as well as decreased healthy seed so it should be necessary to conduct rearing operations and rejuvenation in order to produce high-quality seed. The regeneration in planted stand was 1239 i.e. about four times greater than natural one. Based on obtained results 95.41% of seeds in natural stand were unhealthy and empty, which may be due to aging and

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infection by pests and diseases, and this should be further investigated. Average vitality in planted and natural stands was 61% and 59%, respectively. Four pest species were observed and identified including *Caillardia azurea* Log., *Acanthococcus abaii* Danzig., *Eriophyes sp, and Allactaya elater* Lich. It was observed that Caillardia azurea Log. had caused the highest infection in both stands. *Eriophyes sp* was found only in natural stand and similarly *Acanthococcus abaii* Danzig was observed in planted stand. Perhaps part of the decline in quality indices in natural stand (compared to planted stand) is due to the high abundance of ticks. Results showed that 52% of individuals in natural stand and 88% in planted stand were completely infected by pests that it suggest the higher resistance of natural stand compared to planted one. Considering the extent of areas planted with *Haloxylon* at the country and assigning time and money to carry out desert greening projects, it is necessary to study and investigate in different regions for several consecutive years and by identifying pests and diseases; and better control and management of pests and diseases could be achieved using traditional and modern thereby stands at risk could be preserved. Also identification of genotypes resistant to pests, diseases and environmental stresses would be very beneficial. Also implementing rearing principles based on nature of species and habitat conditions in order to improve the quality of natural and planted stands of *Haloxylon* will be effective.

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The Identification of the Red Grape Bunch Using Image Processing and Neural Networking

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Abstract— In this study a system of automatic processing based on color and color components is explained. About three hundred images have been taken from Urmia's grape fields from early morning to evening in sunny and cloudy weathers. Multilayer *perceptron* neural network with an after-error-publication learning algorithm was used as one of the tools of artificial intelligence for recognizing and separating different image classes. The input of the network was the average of the color components (R, G, and B) of the pixels of the images and the outputs of the network were [1] as the red grape bunch and [0] as a non-grape objects (i.e. leaves, sky, branches and trunk) which, finally, after trying and testing of the learning algorithm the number of neurons of the neural network was determined; using 13 neurons in the hidden layer and one hidden layer the learning algorithm of Trainlm with sigmoid function was able to recognize and separate picture classes with 98% precision. The results of the analysis of the pictures show a high precision in the separation and classification of classes of pictures.
Keyword— red grape, picture processing, artificial intelligence, vision machine.

I. Introduction

Based on the statistics of the Ministry of Agriculture, 306,000 hectares of farm lands have been used for rearing grapes in 1390 in Iran, producing over three million tons of this fruit and putting Iran in the 7th place in the international ranking. (FAO 2011) Harvesting most of the farm products and greenhouse fruits requires a great amount of workforce and consequently increases the cost for these products. If the harvesting process could be mechanized and automatic harvesting machines could be used, a great amount of the expenses would be eliminated and instead, more fruit with a higher quality could be produced. Using automatic machines for controlling, protecting, and harvesting for those fruits, which are used widely by people, seem very efficient. This job is efficient mostly because by using fewer numbers of workers and instead using harvester robots, we can pick fruits from the trees in better conditions. Digital picture processing techniques, vision machines, artificial intelligences (neural networks) and branches related to these, are becoming more prevalent in the fields such as technical and engineering sciences including engineering of agricultural machinery. Of the main advantages of these methods are their being non-destructive and real-time (or fast) and they decreasing human faults.

Color is one of the most important factors in recognizing fruits. In order to develop a suitable classification system based on color, two important factors must be taken into consideration. First, the color system used to recognize and classify different classes must have values with suitable differences in order to make the recognition process feasible.

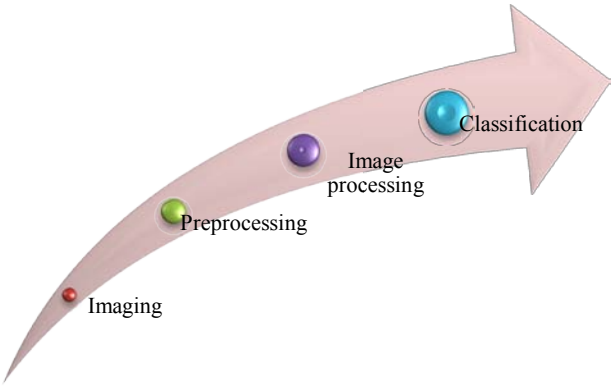

Fig 1. Stages for developing vision machines

Second the speed of the computation in this system must not be very low. For the purpose of classifying different farm products vision machines can be utilized. The stages for using vision machines can be seen in Picture 1. Up until now, many studies have been conducted on harvesting products using vision machines Zand et al (2011) proposed a model for the recognition of greenhouse cucumbers with a focus on neural networking. This network is educated using a number of cucumber anon-cucumber images and their correct responses. The regions obtained from this network will show the exact location of the cucumbers.

Esteban et al. (2009) proposed a vision system for classifying grapes in the store using RGB and HSV color models and neural networking. The best results were obtained using three- layered

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hidden network that had a nonlinear perspective of analyzing main components and reaching a successful amount of more than 90% in all of the experiments.

Zaho-Yan et al (2000) succeeded to identify some varieties of rice using image-processing systems and neural networking. The rice varieties used were z903, xy9308, xy5868, xs11, syz3, ey7954. From these varieties seven color features and nine morphologic features were obtained. From each variety 200 samples were used to educate the network and, after the education, 60 samples were used to test the network.

Guyer and Yang (2000) designed a vision system that could determine the characteristics of the different cherry tissues. Multispectrum images from cherry samples were gathered that ranged from 680 to 1280 nanometers and with distances of 40 nanometers. Using spectrum effects of different cherry tissues in the images, the neural system was used for the classification. Finally, a precision of 73% was achieved for recognition and separation of different cherry tissues.

Majidi et al (2009) designed a vision system for harvesting red and green apples using color images. The result from analysis showed a high precision of 97.5%.

II. Materials and Methods

Images of 300 of seedless red grape bunches were gathered from four grape farms of the Taze-Kand and Nazlu villages of Urmia. The pictures were taken by CannonPowerShot SX30 IS with a resolution of 7 megapixels. Based on the previous research the best way to use the pictures was to analyze them in a color environment and extracting their color features (Pagual et al 2008, Pidipati et al 2008). Each extracted classes of the red grape bunches, green leaves, sky, and the branches were obtained by subtracting the color components, therefore the resulted pictures using this method has very little gray level. To solve this problem, binary images of the extracted classes were used as the input of the algorithm to determine the characteristics of the images. To do this, after initial processing of the images, the average number of every color pixels was calculated using Formula 1 below.

Formula 1. $$A_i = \frac{\sum g_i(x,y)}{N_i} = \frac{1}{m \times n} \sum g_i(x,y)$$

$\mathbf{A_i}$: the amount of the i component; $\mathbf{g_i}$: the amount of the gray level (x,y) in the i component; N_i: total number of pixels in the images; **m**: the number of lines in the picture; **n**: the number of pillars in the picture

The main purpose behind extracting the color components is to decrease the (number of) dimensions of the pictures and consequently decreasing the size of the input data of the system. The main criterion for choosing feature vectors was increasing the *discrimination* between feature vectors of each class. It means that the elements on the vectors are chosen in a way that they are non-equal and mathematically, two times different from each other. At the end, with examining the features extracted for each class of a picture and considering the available memory and the computing capacity of the machine it was concluded that the best results could be obtained using 3x1 vectors. It means that only choosing three features and arranging them as a 3x1 vector in such a way that increases the amount of discrimination among different classes of an image in the environment of the feature vectors is sufficient. In this study, considering the results of other researchers and analyzing different color environments, RGB color environment was chosen as the most suitable environment for classifying and identifying fruit from non-fruit. Because in this method all the data are directly entered into the system, no loss or decrease in size of the data will occur. The input for each network is the average of the main color components (R, G, and B) of the pixels, and the outputs of the system were [1] as the grape bunch and [0] as non-grape objects (leaves, branches, and sky). The average amount of the main components of each image shows the value of the output and determines its being grape or non-grape and introduces it as matrix. The designed multilayer network used in this study for classification and categorization of images functions by utilizing the average of the main color components (R, G, and B) after *back propagation.* Educational networks such as *Traingd*, *Traingdm*, *Trainscg*, and *Trainlm* have been used for educating the network. The multilayer perceptron neural network which has an intermediate level with a sigmoid function and a transporter linear function in output layer can estimate every phenomenon if it has sufficient number of neurons in its intermediate layer. Considering that the range of the sigmoid function consists of all real numbers, there is no limitation in the input numbers entering its network. However, in order to prevent the network from breaking down or premature saturation of its neurons, its pure input must be determined within the limits of the sigmoid function and this means limiting the inputs within the boundaries of [0,1] or to put it another way normalizing the data. Thus, for equalizing the values of the input, all the input data must be normalized. There are various ways for normalizing input; here we have used Formula 2:

Formula 2. $$x_{norm} = \frac{x - x_{\min}}{x_{\max} - x_{\min}}$$

x: true value of the variable; $\mathbf{x_{min}}$: minimum value in the input data; $\mathbf{x_{max}}$: maximum value in the input data; and $\mathbf{x_{norm}}$: the normal value

While educating the network, after-error-publication algorithm was used and the estimated values by the network and the true values were calculated and compared. After the comparison, the number of the errors was calculated and the education continued until number of errors was less than the predetermined error number for a network. If the number of processing errors increases in spite of a decrease in the errors encountered in the education process, then *over training* has occurred and if the number of errors of the network stays constant, or to say it more technically, errors become convergentthe education process stops.

After developing the propitious neural network, for determining the precision of the prepared models for classifying the data, a suitable criterion must be used. These criteria are indexes that can control the effectiveness of the model and also network's convergence. One of the quantitative indexes used in

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evaluating the effectiveness of networks and different models is regression (R). This index is shown in Formula 3:

Formula3.

$$R = \frac{\sum(p_i - \bar{P})(A_i - \bar{A})}{\sqrt{\sum(p_i - \bar{P})^2(A_i - \bar{A})^2}} \quad -1 < R < 1$$

$\mathbf{p_i}$: expected values; $\bar{\mathbf{p}}$: averaged of the expected values; $\mathbf{A_i}$: average of the true values; $\bar{\mathbf{A}}$: average of the true values

Using the regression index anther index is determined which is called Coefficient of Determination (R^2). This index actually shows the amount to which over training lines are on the points specified on the vector. Another index that can be used to determine errors is the *mean squared error* (MSE) which determines the precision of the model by subtracting true and expected values. MSE is calculated using the following Formula 4:

Formula4. $$MSE = \frac{1}{n}\sum(P_i - A_i)^2$$

In this study, in order to boost the efficiency of the neural systems, the main focus has been on increasing the number of data samples to educate the network. If many data samples are used in the process of education of the network, then the network experiencesa wide range of data and its processing reliability increases.

In order to achieve a more exact model and also a model that has a better effectiveness based on color components in a shorter time, we used perceptron multilayer neural system with educational algorithm of after-error-publication. In order to develop the perception multilayer neural network for classifying and grouping of data, two groups of *training data* and *test data* are needed. 70% of the all the data were used for training and the rest 30% of the data were used for testing the model. It its worth mentioning some other scholars such as Nah et al (2006) have used other methods for education and testing the neural network. Their method was based on collecting data from one farm for educating the network then collecting some more data from another farm in order to test it. This method may cause some errors in the neural network (due to different soil and light conditions) which has not been considered in the development of the neural network.

III. Results and Discussion

The effect of increasing the number of neurons on the square of error averages of the hidden layers of the educational algorithm is shown in Picture 2. Increasing the number of neurons in the hidden layer to more than the predetermined number will bring about an increase in the number of the errors of the network. The reason is that the neurons in the hidden layer are serially connected to each other and thus their processes are combined with each other. Therefore, by increasing the number of neurons in the hidden layer, the amount of non-linearity in the perceptron increases and network

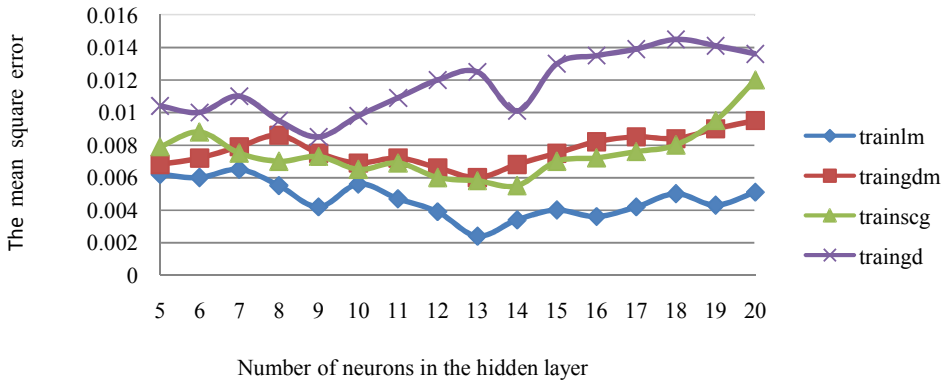
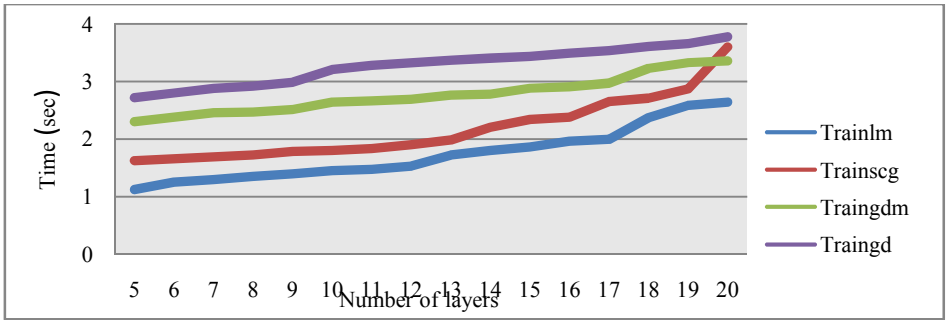


Fig2. The effect of increasing the number of errors in the hidden layers on the square of network error



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As is clear from the Picture 3, with increasing the number of neurons in the hidden layer of the educational algorithm the computation time rises. The results of this experiment show that, Trailm was the best algorithm to educate this network. The efficient number of neurons in the hidden layer in using Traingd, Traingdm, Trainscg, and Trainlm, were 9, 13, 14, and 13 respectively and the error squares of them were 0.0085, 0.006, 0.0055, and 0.0024 correspondingly.

In this paper in order to reach a suitable transporter function, sigmoid function and hyperbolic tangent in the hidden layer have been used. The results are in accord with results of researchers such as Fust (1994), Hikinz (1994), and Menhaj (1384) and sigmoid function has a higher precision in comparison with hyperbolic tangent. Tables 1 shows the comparison between these two functions before reaching an efficient structure with a criterion coefficient of determination (R^2) and average square root ($RMSE^1$)

The results of the predictions for multilayer perceptron network for grouping and classifying of data in the testing stage of the model with educational algorithms of Trainlam and Traingd are given in Picture 4 and 5.

IV. Conclusion

The multilayer perceptron network with after-publication-learning algorithm was used as one of the artificial intelligence tools for recognition and separation of different image classes. The input of the network was the average of the main color components (R, G, and B) of the pixels of images and the outputs were [1] showing the red grape bunch and [0] showing the non-grape objects (leaves, sky, and trunk). Finally after training and testing the learning algorithm and determining a total of 13 neurons in the hidden layer and a hidden layer and the Trainlm learning algorithm and transporter sigmoid function, the neural network could recognize and separate images classes with precision of 99%.

Table 1.comparison of transporter functions

Transporter Function	R^2	RMSE
Hyperbolic Tangent	0.832	0.124
Sigmoid	0.891	0.113

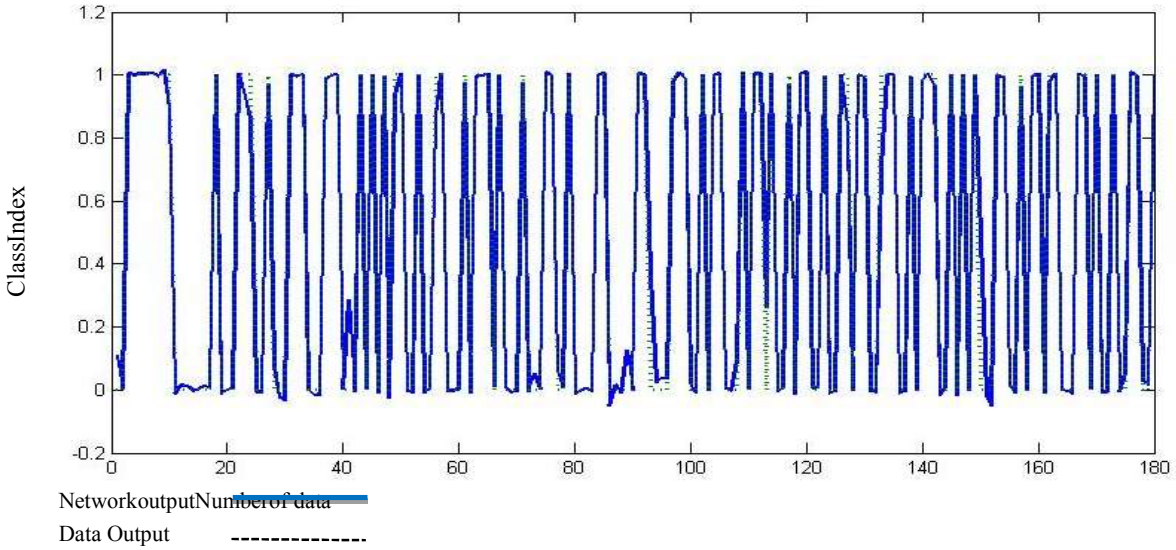

Fig 4. Comparison of the testing stages of the multilayer perceptron network model for the measured data and prediction of the Trainlm educational algorithm.

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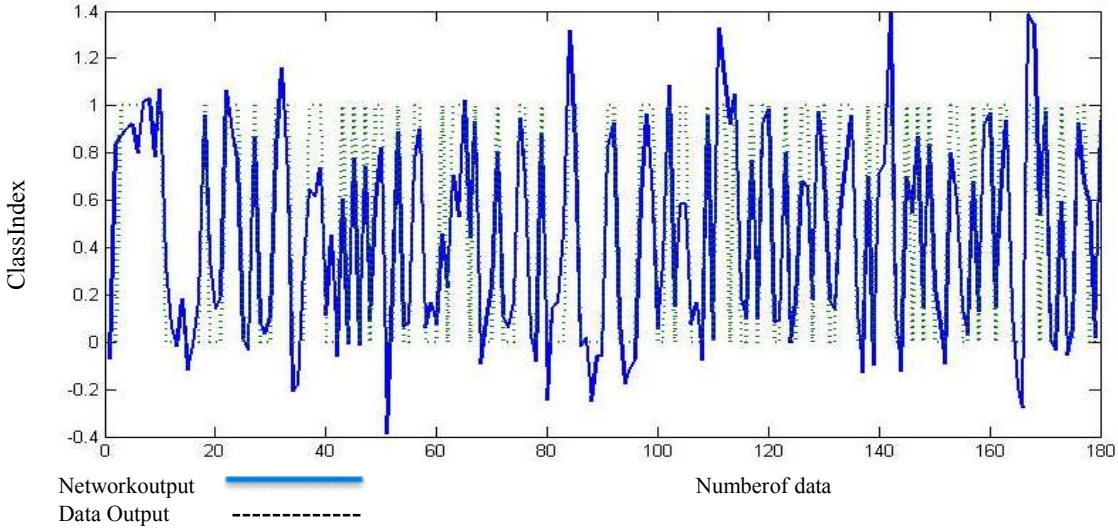

Fig 5. Comparison of the testing stages of the multilayer perceptron network model for the measured data and prediction of the Traingd educational algorithm.

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Strategies for urban green path sustainable development with the emphasize on conservation and enhancement of urban habitat

Mohamad moayedi

Abstract-Sustainable development is established to improve quality of life of citizens, habitat management and reaching to a better future. Planning for urban green path as public space is an effective strategy to gain sustainability. It meets basic human needs in urban spaces and is a combination of framework, spirit, aesthetic y and nature. It also helps improvement of urban identity. One aspect of sustainable green path is landscape as a set of natural and artificial factors which is important for designers because of being real, objective and the result of citizens perception of the city. This thesis is decided to ascertain green path development with the emphasize on urban landscape and sustainable public spaces. Since it has a basic role in joining natural and artificial environment, it is essential to come to strategies and principles as urban designing guide lines. Thesis at firs explains sustainable development and its relation with environmental designing, then determines landscape role in urban green path improvement by descriptive-analytic method library studies. At last, strategies are suggested to reach spatial desirability, environmental aesthetic y and increasing ecological power of urban spaces.

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Key words-, landscape, sustainable designing, urban green path, urban habitat.

1. INTRODUCTION

Environmental problems are of today urban issues. The result is losing balance in ecosystem and inconsistency between human and nature(Firoozbakht,1391,215). So, urban sustainability is seriously under consideration to really meet "present urban communities needs without wasting future generation abilities to meet their needs"(Soflayi,1383,62). Native ecosystem is on the basis of Ecological designing or in other words building with attention to environment. Relation with nature and urban habitat, human and artificial environment is basic and essential in designing process. Urban spaces as public areas are the space of human daily life which is perceived consciously or unconsciously on the way home to work(Pakzad,1376). Urban green path is of urban spaces which can help reaching to sustainable development. Designing this space enriches environment by architectural symbols. Urban landscape includes green path. Landscape is a set of natural and artificial factors which are formed by cultural, social and economic situation of city and present urban characteristics. Urban landscape creates sustainable city(Golkar,1387,97). The main purpose of this thesis is to analyze the role of sustainability in urban landscape with the emphasize on green path and suggests strategies for sustainable landscape designing with attention to urban habitat.

II. THEORY

A. Sustainability and sustainable environment

Sustainability has two aspects: human and framework. This concept wants a subtle balance between today and future needs, also between private motivations and public proceedings(Pouryafar,1389,194). Cities presented the best pattern of Sustainability in past and considering water, nature, resources, native materials were types of Sustainability. But today, not only unsustainable conditions threat inner cities, but also cause outskirt unsustainability as well(Bahreini,1378). Sustainable development suggests solutions to prevent natural resources demolition, ecosystem deterioration, contamination, population overgrowth, injusticy and lower quality of life(Soflayi,1383,62). Sustainable development enhances health and ecological system in long terms. The most important elements of Sustainable development are: ecological constraints, high quality of life and social sustainability, public life, justicy(Aminzadeh,1387). Physically, Sustainable development means changes in landuse and agglomeration to meet citizens housing, transport, free time and food needs, make city a livable place, economically sustainable and socially integrated(Kazemi,1378,61). By these descriptions, a sustainable environment is able to meet some basic needs including spiritual, emotional, mental, also have broad network for social, economical, cultural connections.

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B. Urban public space

Strangers who are not our relatives, friends or coworkers use public spaces. These spaces are spheres for politics, religion, commerce, sport and public communications(Madanipoor,1379,144). Tibalz believes that public spaces are the most important part of cities. People most communications happen in these spheres(Tibalz,1382,15). Public space belongs to all citizens without paying attention to class differentiation, gender, race, age and other social and economic discriminations. Oldinburg knows it as a space in which a person is comfortable and names it "the third space": the host of happiness, informality, regularity and voluntarism(Oldenburg,1999,184). It includes street, square, plaza, city hall, mall, park, corners and etc(Habibi,1379,31). A common feature in all of them is "public attendance".

C. Green path

Urban spaces should draw nature to cities(Shie,1385,62). Urban green spaces as a part of urban public space are built by human surveillance and management rules and principles for improving health conditions, in which natural or artificial areas are filled with trees, flowers, grass and etc(Ruyan consulting engineering,1389,9). During 19th century building park was a pioneer thought in planning open spaces and it very soon transformed to green path(Terner,1376,383). Urban green spaces are divided in two categories: linear and area. green areas are seen as green stains on city maps while green lines are usually along natural or artificial elements. They may not be seen on city maps(Ruyan,1389,9).

D. City landscape

Landscape has a significant role in forming cultural, social and environmental contexts. It can also help developing economic conditions and creating subcultures. It is a vital infrastructure for making cultural and environmental heritage(The European landscape conservation,2000). The term "city landscape" was first used by Gordon Callon(Hosseini,1387,84). He believes that city landscaping is visually and physically the art of unifying buildings, streets and places. The one`s opinion about city landscape is affected by sense of place, environmental concept and sense of sight(Mahmoudi,1385,75). He introduces three sorts of landscape: self presenting, hidden and closed(Callon,1387,43). City landscape includes framework and quality concurrently. City perception is landscape interpretation.

E. Sustainable urban landscape

Some theorists like Tampson and Estiner introduce two main elements: creativity and ecology as principles of sustainable landscape. Natural ecology has a tight connection with culture. sustainable landscape designing is based on ecologic principles and aesthetic. The base of landscaping is sustainable place in which four elements: framework, action, mentalities and ecosystem are helpful(Feizi,1387,36). The climax of sustainable development is 1980. It divides to four main subjects: objective aesthetic, subjective and perceptual aesthetic, functional aspects and ecological issues(Golkar,1385,41).

F. Sustainable urban landscape components

With attention to subjective and objective landscape and three dimensions forming it: action, form and perception and regarding to environmental sustainability components, principles below can be mentioned for designing and planning:

G. Sense of place

Sense or spirit of place points to an special quality a place have. This is an intouchable sense but a valuable adjective

that when it is added to a place, make that sensible. Sense of place is the relationship between situation, landscape and individual spin. Sense of place divides to two categories: perceptual-cognitive and physical. It improves human connections with environment by creating memorable, viable, identical spheres(Falahat,1385,63).

H. Identity of a place

Identity of a place forms and grows by experiencing physical environment directly. So, it is a reflection of social and cultural aspects of a place. place based identity is a public or individual`s feeling that is stimulated by connecting to a place. Four elements are the basis of place based identity: Discrimination(purpose of using a place), self esteem(satisfaction of being in a environmental and social place), efficiency(function and action implemented in a physical environment) and continuance(environmental personal experience)(Ghasemi,1383,74).

I. Memorability

Environment perception is connected to memorials. Memorial depends on being in a place and a good memorial encourages people to reattend the space. Strengthening memorable elements by urban landscape is a way to attach citizens to the place and deepen sense of attachment. These elements can be physical or functional(Shuls,1382,73).

J. Legibility and a bright image of an environment

If citizens lose their orientation in city, they will feel insecure. An urban space should be transparent that implicates: orientation in city, familiarity and security, increasing experiences and common memorials. Urban landscape can transfer information to citizens(Newman,1387,20).

K. Public perception and visual pleasure

Human perception of a landscape has a determinant role in desirability of an environment. Handmade environment unlike natural ones is vary changeable, miscellaneous and complicated. Therefore, environment perception is subject to many inner and outer variables. Cognition, feeling and users behavior should be determined to understand public perception of urban spaces(Bier,1381,207).

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L. Form

Landscape includes objective and subjective forms and causes functional, visual and spiritual manifestation of space elements. Landscape is touchable so it appears in form. Disheveled forms cause worry, frustration, fear and escape. While studding landscape aestheticy, materials, designing style, coordination of form and context and proportion should be considered(Rezazadeh,1386,20).

M. Ecology and environment

Sustainable habitat means continuance of "living" in a habitat. It is urban designers duty to draw greeneries to city and trim natural elements. Greenery affects mentalities as well. Linear greeneries are useful for contaminated areas(Bahreini,1377,256). Urban landscape components are analyzed in Table1:

Table(1): Sustainable Urban landscape components

Sustainable Urban landscape components	**Sense of place**	Respect to human needs	Peace, security and beauty
		No desire for supersede	
		Interest	
		Flexibility	Space ability to accept functions and actions
		Visual consistency	Coordination between function, meaning and visual characteristics of the landscape
	Place identity	Effect on attendances	
		Self confidence	
		Discrimination	Landscape Discriminative elements-purpose of using the space
		Efficiency	coordinated landscape with function
		Continuance	Personal experience of environment
		Culture	Manners, customs and believes of a society
	Memorability	Attachment	Satisfaction and place attachment
		Familiarity	
		Experience in the space	Memorials and experiences
	Legibility	orientation	Find the way easily
		Transparency	A bright image in mind
		Leader	Leading elements
		signs	Specific elements and symbols
		Coordination of form and function	Easily finding the way
	Public perception and visual pleasure	Aestheticy	Desirable environment with attention to color, materials, structure,etc
		Attraction	
		Amazement	Amazing elements
		Variety	Variety of forms and functions
		Safety	No hazards-access hierarchy
		Visual penetrability	Visual connection with different points
		Viability	

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	Form and morphology	Fabric and ornaments	
		Shape and dimensions	Geometric regularity, proper dimension
		Capacity	Space capacity
		color	Peaceful colors
		Arrangement and connection	Furniture arrangement proper with human needs
		Human scales and dimensions	Human scales
		Light	Illumination in day and night
		Proportion	Spatial proportions
	Ecology and environment	Contamination	Contamination remove
		Natural elements	Green elements
		Climate	Climate changes
		Renewable energies	

N. From sustainable environment designing to sustainable landscape designing

Mc Harg published "designing with nature" in 1996 in which terms like ecology and environment were emphasized(Mc Harg,1386). In this process the main purpose is to link land and human. Landscape is considered as a set of spatial, biological and social networks. In this approach, light, shadow, wind, water, topography, habitat and etc are used in designing open, closed and half closed spaces by mixing ecologic and aesthetic principles(Bozorgy,1383,48).

Ecologically designed landscapes are able to improve environmental quality and make cities livable places, also have significant role in sustainability of public spaces. Ecological urban design and sustainable environmental design principles are presented in Tables 2 and 3:

Table(2): Ecological urban design principles

principles	**Subject**
Minimum intervention in natural environment	Maximum variety(landuse and actions)
Optimum balance between population and resources	As a closed system

Table(3): Sustainable environmental design principles

Designing principles	**Concept**
Knowing the place	Sustainable designing needs better knowing the place to prevent deterioration and facilitate access.
Connecting to the nature	Nature should be considered in designing sites.
Knowing natural processes	There is no waste in natural environment. Natural systems have a closed cycle. An organism supply food for others.
Knowing environmental effects	Sustainable designing also includes site evaluation. Development negative effects can be reduced by using renewal energies, sustainable materials and technology.

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Knowing people	Sustainable designing should pay attention to a broad area of culture, generations, religion, habits and needs.

Peter keltrop believes that urban design is beyond environmental aestheticy. Urban design components are: objective aestheticy, subjective aestheticy and environment and function(Golkar,1387,101). Sustainable landscaping also emphasizes on these four elements. A sustainable urban landscape formally or informally has geometric, natural, simple or complicated regularity(E,Dell,200910). Important factors in landscaping are presented in Table4:

Table(4): Sustainable urban landscape designing index

Index	**Sustainable urban landscape**
Live system	A sustainable landscape functions like an active system and without control, intervention and irreparable damage over live systems.
Self sustainability	Firmness or self sustainability is the balance of forces in a live system in a way that no force is out of control and system is not damaged.
Careful designing	Sustainable landscape(aesthetic and efficient) is the outcome of a authentic designing.
Circular designing	Recycling regarding to natural patterns
Regarding nature	Land, climate, light, greenery and other native factors
Out put/input Precise management	A sustainable landscape takes benefit from nature. Inputs and outputs are minimized, so all side effects are useful.
In-site Foot prints	Adding each element shall be done carefully. Added element should become a part of the natural circle.
Out-site Foot print	No damage should threat the premiere source.

Regarding to ten factors of designing sustainable linear path: self sufficiency, improving environment, decreasing contaminations, centralization, respect human needs, flexibility, efficiency of resources, variety and choice, distinguish and surveillance(Pourjafar,1389,196), a sustainable path is necessary to be built. It is connected along a way and strengthens with the passage of time. It also depends on place based identity that includes past(supportive) and present.

Table(5): Strategies for urban green path sustainable designing

Strategies for designing green path	**Aspect**	**Factors of designing sustainable landscape**	**Factors of designing sustainable path**	**Factors of designing Sustainable environment**
- Flowing design to connect spaces to each other - Congruous spaces near each other - Various land use in one land in different seasons of the year - Amenities - Safety and security - Connecting spaces - Increasing citizens presence in space	Functional	Out put/input Precise management	Self sufficiency	**Place recognition**
		In-site Foot prints	efficiency of resources	**Knowing Environmental effects**
		Out-site Foot print	Flexibility	

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- Under control access - Rich greenery - Miscellaneous landscape - Natural elements in designing landscape - Proper junctures to join green ways with different functions together - Emergency vehicles - Avoid unseen corners	Objective aestheticy	Careful designing Circular designing	Variety and choice Surveillance	
- Green path designing - Unity and integration of elements in the way - Unique method in designing all ways - Opportunity of jogging - Safe infrastructures - Social communications - Proper symbols and signs - Specific signs in entrances or public spaces - Paying attention to green path while constructing - Linear green path - Improving linear greeneries - Connect to city center	Subjective aestheticy		centralization Respect human needs Distinguish	**Human needs recognition**
- Planting with attention to habitat pattern and ecosystems - Controlling contaminations - Avoid cutting trees - Continual Green path - Future Opportunity to enhance greeneries	environmental	Live system Self sustainability Regarding nature	Improving habitat Decreasing contaminations	**Connecting to nature** **Knowing Natural process**

Table(6): Executive guidelines for designing sustainable green path

Structure	**Criterion**	**Executive guidelines**
Landuse	Applied landscape	- Greeneries to decrease contaminations - High quality spaces
	Public open space	- Social interactions and walking in a climate based designed space - Greenery to create viability and activity
Walls	-	- Native material - Proper plants
Access pattern	-	- Continual, flat and proper ground for jogging - Distinguished path for bicycles - Path for Emergency vehicles
Greenery	-	- Conservation and improvement of greeneries - Climate based planting - Conservation of old trees
Visual axis		- Emphasizing on green axis

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	-	- Developing linear greenery
Floor	-	- Continual and proper paving in the path - Native materials - Absorbing Rain and surface water by plants and paving
Furniture	-	- Native material in climate based designed furniture - Proper Site selection for furniture - Coordinating plants, environment and furniture

III. CONCLUSION

Linear green path have the potential to be an urban sustainable axis. Planning this space helps conservation of the habitat and decrease in contaminations. Designing urban green path has two main stages: getting to know the present situation better and analyzing. Using principles and criteria in designing sustainable landscape and green path, enhances ecological power of cities. Functional, ecologic, objective and subjective aestheticy goals of sustainability include: sense of place, place identity, memorability, form and etc. each factor promotes another and causes spatial desirability and ecological equilibrium.

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Study of drought stress effects on germination of barley cultivar (Abyt-w-2-18) seeds in the germinator

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Abstract— In order to evaluation of drought stress effects on germination and growth parameters, barley seeds (*Hordeum vulgare*) cv (Abyt-w-2-18) imposed to polyethylene glycol 6000 as potential osmotic supplier. The experiment was carried out in completely randomized design with three replications and osmotic potential was at 4 levels including control (without polyethylene glycol), -0.4, -0.8 and -1.2 bar. The results showed that drought stresses compared to control were not affect to germination and growth parameters of these barely cultivar. This may be due to these cultivar of barley were adapted to drought stress considerably.

Keywords— barely , drought stress, polyethylene glycol, germination phase
.

I. Introduction

Drought stress is one of the most important restrictive agents of growth and yield of crops. Drought stress affects 40 to 60% of the world's agriculture lands. Breeding for drought resistance is complicated by the lack or fast, reproducible screening techniques and the inability to routinely create defined and repeatable water stress conditions when a large amount of genotypes are to be evaluated efficiently. According to Crammer et al (1989) drought stress is absence or lack of water in plants environment that resulting plant was damaged. Throughout the plant life, different phase of plants growth depend on water available and their efficiency. The plants with high ability in water uptake or water efficiency are more tolerant to drought stress. Among cereal plants, barley with scientific name of barely (*Hordeum vulgare*) is one of the most important crop families which after wheat ,rice ,corn and potato has the fifth rank in production point of view in world. also is main food resource for human beings and livestock in middle east. The adaptation of barley is better than wheat and other crops in environmental stresses condition. Barely has a broad ecological adaptation and it is more tolerant towards drought and calcareous soils [1].As other crops, yield of barley is very complex trait and depends on many environmental and genetic factors . One of the most sensitive life phases of barley plant to drought stress is germination and seedling growth [2]. Loss of barley yield through the drought stress occurs by the shortening of the vegetative phase and size of the plant [3].The study of late drought stress on grain growth and yield have been studied in cereal crops.Drought stress during the gain-filling period decreased the net photosynthetic rate of the flag leaf of barley. So it is necessary to identify tolerant cultivars of barely and culture in regions of arid and semi-arid until increased yield efficiency. Iran, with an average rainfall of 240 mm per year is classified as arid and semi-arid regions. Therefore, many studies have been done in relation to plants breeding or Identify plants that have been tolerant to water deficit conditions. Dashtestan centered Borazjan city, located at the 85 Km east of the Bushehr city (center of Bushehr Province) and 29°4'60" N and 51°36'0" E coordinates in DMS (Degrees Minutes Seconds). This area located at an elevation of 770 meters above sea level and largest and most populous city in this province. Temperature of Dashtestan varied between 0 ° to 50 ° throughout the year, and annual rainfall is about 250 mm.

As mention above, the native barely cultivar (Abyt-w-2-18) was subjected of various concentrations of drought stress in this study. Then, some of the parameters of seed germination of this cultivar were measured.

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II. MATERIALS AND METHODS

Seeds of barely were obtained from the Research Center of Dashtestan, Bushehr. This Experiment carried out with 20 seeds on plastic dishes in three replications. Before seeds treatment, they were soaked in water for 2 hours and then were embedded in 2.5 percent hypo chloride solution for 15 min. Then, the seeds washed thoroughly under tap water and in the end with distilled water. The experiment was carried out in the germinator (25±1 C°, 45% relative humidity). Osmotic potential was at 4 levels including control (0), -0.4, -0.8 and -1.2 bars by polyethylene glycol 6000 as potential osmotic supplier. Drought stresses by the polyethylene glycol were calculated according to Michel and Kaufmann, 1973. The formula as follow:

$OP= (-1.18 \times 10^{-2}) \times C - (1.18 \times 10^{-4}) \times C+ (2.67 \times 10^{-4}) \times C \times T + (8.39 \times l0^{-7}) \times C^2T$ (1)

Where OP: the potential of osmotic stress versus time, C: concentration of polyethylene glycol, T: temperature in Kelvin (298 ° C) was considered.

The germination of seeds was ended after 1 day and root exclusion criterion for germination was defined as 2 mm. After germination, root and shoot length, plant dry weight, root dry weight and decreased the germination percentage were measured. Mean germination time according to the equation of Ellis and Roberts (1981) were calculate. Analysis was carried out by EXEL (2007) software.

III. RESULTS AND DISCUSSION

Among the environmental factors hindering the growth and yield of crops, horticulture and medicinal dryness is the main cause of production loss, especially in arid and semiarid regions is considered. There are many strategies to overcome the negative effects of drought. One good strategy, selecting cultivars tolerant variation of the drought condition. Germination in the control condition and three osmotic potentials of control (0), -0.4, -0.8 and -1.2 bars are shown in Table 1. These results are well adapted to drought conditions in the atmosphere , the figure shows that due to the resistance of barley cultivars as well as the growth of health due to the stress of coping with water shortage in the region.

Drought causes the crop to withstand that kind of stress, but a marked decrease in yield is observed**.** This makes it difficult for the farmer And thus the efficiency of the farmer must decide what level of deficit irrigation to take, When no water is applied and when it is used less water than a typical consumer To achieve maximum water efficiency and minimum cost[4].

According to the most sensitive to drought in barley plants during stem elongation, swelling of the sheath of the flag leaf and flowering time and stress before or simultaneously with the heading shows the greatest reduction [5]. Table 1 The number of seeds germinated in various concentrations o f the stress shows.

Treatments	Replication1	Replication2	Replication3
Control	20	19	20
−0.4	18	20	20
-0.8	20	20	20
−1.2	20	19	19

Table 1: verses seed germination in control conditions and concentrations of -0.4, -0.8 and -1.2 -0.4 -0.8, and -1.2 in the germinator

Accordingly it was decided due to the resistance in barley seed germination of other parameters such as root length, shoot length, root fresh weight, shoot fresh weight, root dry weight, seedling dry weight (shoot) were measured. Table 2 root length and shoot with ten repetitions after repetitions in control of germination in the show.

Number	Shoot length	Root length	Number	Shoot length	Root length
1	9.3	1.1	6	9	5
2	5.4	7	7	6.2	5
3	9.3	7.1	8	8.1	4
4	6.3	8.1	9	2	5.5
5	4.1	9.1	10	7.1	4

Table 2: Root length and shoot, repeat after germination ten Milli meters in control

Then, to obtain more accurate results, root fresh weight, root dry weight, shoot fresh weight, shoot dry weight, repeated every ten samples analyzed in Table 2 were measured average. Table 3 root fresh weight, root dry weight, shoot fresh weight, shoot dry weight, repeated every ten samples analyzed in terms of the hot shows.

Root fresh mass	0.3689
Root dry mass	0.0290
Shoot fresh mass	0.1661
Shoot fresh mass	0.0202

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Table 3: root fresh weight, root dry weight, shoot fresh weight, shoot dry weight, repeated every ten samples in the control g
After careful evaluation of all the parameters listed above to control the ambient concentration of polyethylene glycol was calculated -0.4 and was listed in Table 4.

Number	Shoot length	Root length	Number	Shoot length	Root length
1	4.3	1.7	6	9.2	1.3
2	3	1.2	7	4.6	1
3	1.3	1.1	8	6.3	9
4	3.2	1.9	9	3.3	8
5	4.4	1.2	10	6.2	6

Table 4: Length of root and shoot, repeat after germination ten millimeters in -0.4 concentration of polyethylene glycol

Comparing Table 4 with Table 3 reveals a good thing The concentration of polyethylene glycol -0.4 a significant impact on root length and shoot length and the shared environment is shorter compared with the control environment Themselves from adverse effects of drought on barley cultivars in the region. Table 5 root fresh weight, root dry weight, shoot fresh weight, shoot dry weight, repeated every ten samples analyzed in terms of the hot shows.

Root fresh mass	0.2475
Root dry mass	0.0278
Shoot fresh mass	0.0071
Shoot fresh mass	0.0071

Table 5: root fresh weight, root dry weight, shoot fresh weight, shoot dry weight, repeated every ten samples in the concentration of polyethylene glycol -0.4 g

Assessing the negative effects of stress concentrations also showed -0.8and -1.2 That negative impact of this concentration with increasing concentrations of polyethylene glycol on root length and shoot and root fresh weight, root dry weight, shoot fresh weight, shoot dry weight was greater. Comparing the results of this study with other similar studies show similar effects. In other research on the impact of drought on barley cultivars were ten different characters, as well as the negative effects of stress on grain yield, plant height, spike length, time and address ... The proof is[6]. The results of this research study as well as the length of root and shoot inbreeding and polyethylene glycol concentrations in the environment are shorter than the control environment. In addition to research on drought tolerance in barley cultivars to drought stress at the end of the growing season was Barley grain yield under drought conditions, grain yield in non-stress conditions was[7]. The present research work is also a significant difference.

IV. CONCLUSIONS

Drought is one of the most important environmental factors that affect seed germination and seedling establishment. The results showed affect of different levels of drought have no-significant on germination per control. For example the length of root and shoot in -1.2 bar showed no significant changes per different treatments, That indicating the resistance of this barely to drought stress. The studies indicate that could be used of barley cultivars in arid and semi-arid regions But stimulation of barely plants with drought stress in more advanced stages may have significant negative effects on plant growth and development. Further experiments are needed.

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Requirementsof proteinand lipidforreared Pike perch (*Sander lucioperca*) fingerling inculture centers

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Abstract _ Pike perch *(Sander lucioperca)*isafish eater species especially at the begging of life in thefirst summerwhen their lengthto became100-50mm ganged their behavior. Pike perch even whenfeeds on small fishare continues feedingonbivalveup toage 2,especiallyincases where thenumbersoffish islowandinvertebratesishigh.Pike perchdietlargelydepends onfoodavailability. Especiallysmallerminnowfish and Ruffe (*Gymnocephaluscernua*) arepart ofthe dietof these fish.In Azovseapike perchfeeds species such as *Clupeonella*and*Rutilus*.Pike perchInthe Caspian Sea addition totheitems mentioned, willeatKolme (*Rutilusrutiluscaspicus*)and Swordfish. Pike perch mainly hasfeedscarp fish and less than consumed benthicand Nektobenthos. Thisfishisa major consumer ofCaspian Clupeonella inthe CaspianSea.Thisarticle investigatedpike perch foodneedssuch asproteins,lipids and carbohydratesforculturelarval and fingerlingsperchforfarmsand culture centers.

Keywords_ Pike perch *(Sander lucioperca)*, protein, lipid, carbohydrates.

I. INTRODUCTION

Collected informationabout thenutritional needsPike perchfishisverylow.with the researchonanalysisof Pike perch(*Sander lucioperca*)stomachsinlakesEgirdirand HirfanliofTurkeywas foundthat fisharethe main foodin thesespecies(about60percent) andentitiessuch as theamphipods(Gammarus),Diptera(Chironomid), insect larvae, andbivalve(Mysis), Mollusca andIsopodaarethenext levels[17]. Here we study thenutritional requirements of Pike perchlarvae and fingerlings in the natural environmentandcultural center.

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II. PIKE PERCH LARVAE FEEDING

Pike perchlarvae feedonthe natural environment:

At the begging Pike perchlarvae feeds onmicro-zooplanktonin the natural environment. Thenwith increasingsize consumethe Copepodsand, in thebigger size would likeuses Chironomidaelarvae [16].Approximately4 cminlength, Pike perch began to hunt of juvenile forage fish (Table 1) [1].

Table1–percentlive foodsconsumed byPike perch fingerling during aged1-5 months in earthen pondsofGermany[15].

Age(months)	1	2-3	4	5	Average 1-5months
Averageweight(g)	0.7	2.9	4.4	6.7	-
Number of fish	45	36	44	201	326
Number ofpools	3	3	5	13	24
Hirudinea	-	-	-	9	-
Daphnia pulex	-	8	-	-	-
Daphnia longispina	27	5	36	5	18
Ceriodaphnia sp.	-	-	4	-	-
Copepoda	41	5	11	14	-
Asellusaquaticus	-	-	-	5	-
Cloeondipterum	-	-	-	49	12
Chironomus sp.	4	10	24	10	-
Glyptotendipes sp.	14	17	7	4	11
Endochironomus sp.	4	3	-	-	-
Corethraplumicornis	6	46	13	8	18
Pisces	-	6	-	-	-

Studies have shown that in the natural environment,Naupliis and Copepoditesare the 85/98% of the weight contents of the digestive tract in larval feeding at the begging of external feeding. But in bigger fish content of Copepoditesdecreased and increased amount of small Cladosera in digestive tract. Rotifers are rarely consumed by larval pike perch. Therefore pike perch larvae in the natural environment at the beginning of an external feedingwidely

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prefers Naples copepodto use as food and in larval stage, Cladosera are abundant in their diet [11].

Pike perch larvae fed in rearing:

Use the fertilized ponds is the most common method for reared pike perch larvae .In the first few days of life, pike perch larvae mouth is small enough that it can only make use of zooplankton smaller than 190 microns. After about4-6weeks, pike perch larvae reach a size that can consume formulated diet. These transitions to formulated diet are often performed in ponds or tanks by automatic feeders [7].Alternatively method for larvae fed is the use both natural and artificial diet. In this stage Artemianauplii is one of the most popular and best live foods used in the early stages of feeding larvae. Used Artemianauplii continued up to change habits then used artificial diet for dietary [5]. In recent years a number of formulated diets for pike perch larvae were collected, but none had required performance of the fish diet, so now commercial rainbow trout diet or marine fish diet as a base diet is used for feeding pike perch larvae. The most common method of feeding pike perch larvae in laboratory studies, is manually feeding. A comparing study was performed on commercial rainbow trout and marine fish diets. This result showed that rations specific growth and survival rate by the commercial rainbow trout diet are better than marine fish diets as a feed (Table 2).

Table2-Specificgrowth and survival rateof pike perchlarvawithdifferent diets.

Diet	Duration of experiment (days)	Initial Weight (mg)	The final Weight (mg)	Survival (percent)	Reference
Live foods					
Artemianauplii	14	3.4	105.8	64.5	Mamcarz *et al*., 1997
Zooplankton light	7	16	90	77	Kestemont and Melard, 2000
Meta Artemianauplii enriched with vitamin C and HUFA	19-37	8.1	372.7	70.9	Kestemon*et al*., 2007
Formulated diet					
Commercial diet	32	0.3-0.5	120-150	<1	Schlumberger and Proteau, 1991
Aglo Norse	7-35	5.2	210	52.4	Ostazewska*et al*., 2005
Bio Kyowa	7-35	5.2	208	50.8	Ostazewska*et al*., 2005
SFT rainbow trout diet	19-37	8.1	230.8	77.4	Kestemon*et al*., 2007
Nippai shrimp feed (matine diet)	19-37	8.1	144.5	63.9	Kestemon*et al*., 2007
Fresh water fish larevae (Cyprico diet)	19-37	8.1	176.6	52.4	Kestemon*et al*., 2007

Automaticfeeders are used forlarvae andfingerlinginnursery pond.In earlyhatching larvae digestivetractis incompleteand their growth is fast therefore they continuouslyneed to have diet in their digestive system [3].

III. THE NUTRITIONAL REQUIREMENT OF PIKEPERCH FINGERLING

Proteinsand amino acids:

Little informationabout thenutritional needsof eachpike perchhave been published.Dietary protein must be providing essential and non-essentialamino acids needs for pikeperch[15]. The minimumrequireddietary crude proteinof pike perchlarvaein about52percentthat have allthe essential amino acidsneededtosatisfy [3].The Yellowperchproteinrequirementhas beenreported in the range of21-27% of the dietary,althoughthe highest weight is obtainedoffish fedwith34%protein[11].Another studysuggests thatthe optimalamount ofproteinrequiredforWalleyeperchfrom8 to50grams ofweightis reduced. The8 and 50 grams Walleyes protein needs is51%and 42% have been reported,respectively.Optimum crude proteinrequirement for pike perch fingerlingis about36-56% of the dietandabout40-49% is used of applydiet.Of course,thefishprotein needs isvarywithdifferent weights[3].Inthe most recentreviewthe effect of differentlevels protein in dieton growth,feedefficiency, body composition, and survival rate ofpike perchfingers. Treatmentsconsisted ofdietscontaining withsixlevels of protein(26-33-40-47-54-61% dry matter) that performedon1gfishfor 56 days. These results showed thatthe protein levelof 54% has the best performanceon1g pike perch[11].For pike perch with the average weight 47-52g,the

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proteinneedstoprovidedevelopmental requirementsabout43-50% of the ration dry matteris calculated[10].

Fats andFatty Acids:

Pike Perchlarvae didn't have necessary enzymefor theconversion ofoleic unsaturated fattyacidstolinoleic and linolenicunsaturated fatty acids. The amount ofsaturated fatty acids, monounsaturated fattyacids(MUFA)andpolyunsaturated fatty acids (PUFA)forpike perchlarvaewasdetermined(Table 3).Pikeperchlarvae dietarycrudelipid optimum about 13% has been reported [3].In a study effects ofdifferent levelsof lipid(9-13-17% of ration dry matter) withtwo levelsofprotein(470-540g/kgDM)were investigated ongrowth andbody compositionparameters.Thebestresults offeed conversion rates and growth was observed, particularly in thetreatmentof highlipid levels(protein to lipid ratio) (P / L 47/17, P / L 53/17), respectively. With increased lipid levels of diet, dry matters and crude lipidscontent of the pike perch body increased, but no significant differences were observed in carcass crude protein and ash. Unlike already findings on pike perch, this study implies that the dietary protein can be reduced by increasing the lipidof diet that have been demonstrated by other fish such as salmon (*Salmosalar*) [6],rainbow trout(*Oncorhynchusmykiss*) and common carp (*Cyprinuscarpio*)[17]. In the following of experiments to obtain with increasing levels of lipid dietary pike perch, Hepatosomatic index was increased,therefore this matter limit us to use high levels of lipid in pike perch diet[13].

Table3- Pike perchlarvaefood needs[3].

Nutrients	Initialweight(mg)	Amount required	Typediet
Crude protein	0.2-3	52%	DAN-EX 1352
Crude lipid	0.2-3	13%	DAN-EX 1352
SFA[1]	0.2-3	23%	Aglo Norse
MUFA[2]	0.2-3	43.8%	Aglo Norse
PUFA[3]	0.2-3	32.9%	Aglo Norse
n-3	0.2-3	18.8%	Aglo Norse
n-6	0.2-3	14.1%	Aglo Norse
Carbohydrates	0.2-3	17%	DAN-EX 1352
Ash	0.2-3	10.3%	DAN-EX 1352
Phosphorus	0.2-3	1.4%	DAN-EX 1352
Net Energy	-	4921kcal	DAN-EX 1352

1 - SFA:saturated fatty acids, 2 - MUFA: monounsaturated fatty acidswithadoublebond,3 - PUFA:polyunsaturated fatty acidswithadoublebond.

In another study the effects of different levels of lipids and lipids type on growth performance and body composition were examined on pike perch juveniles. First experimental treatments on 22 g fish was performed with (24-18-12-6 % lipids of ration dry matter) in diet, the best growth and feeding conversion rate(FCR) was reported to treatment contain with 24 % lipid , while the highest accumulation of lipids in the body observed in this treatment whereas had no significant difference in the protein content of the carcass. In the second experiment, treatments consisted of two levels of lipids (18-12% lipids) from animal fats (fish oil) and vegetable oil (linseed oil) that had no significant effect on growth and feed conversion ratio, but specific growth rates (SGR) in treatments vegetable oil was lowered. The type of lipidhad no effect on dry matter, crude protein and crude lipid,but only in treatment animal fats (fish oil) content of ash decreased [9].

Carbohydrates:

PikePerchfishlarvaehave alimited ability touse carbohydratesbecausethese fishhave carnivores'behavior[14]. Optimalcarbohydratedietforpikeperchlarval about17% has been reported [3]. Effect ofdifferent levelsof carbohydrate, lipid and protein onpikeperchwithinitialweight50 gwas examined. Treatment contained of (20-15-10%) carbohydrate in diet thatthe least effectivewere observed in treatment with 10%carbohydrate andthe bestresultswere obtainedin thetreatments of20-15% carbohydrate in diet [10].

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The role and function of Astaxanthin pigments in fish and shellfish

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Abstract_ Among themany valuablecompoundsinfish, isa pigment calledAstaxanthin. Thispigmentisa subset ofXanthophylpigmentthathaspink to red paint causedthe aquaticmarketing. Thered color ofcookedcrustaceansisdue to the presenceAstaxanthinwhilethat happensto bedenaturedCarotenoproteins withheatfromcookingandcomein red.Pinkishredinwildsalmonfillets(*Oncorhynchusnerka*)andrainbo w trout(*Oncorhynchusmykiss*)isa signpresence of Astaxanthinthatprotecttissues andcellsagainstoxidation.Thereforecan be said toexistAstaxanthinmay is ahealthysign tofreshness offish. Thispaperstudiesthe roleand function ofpigmentAstaxanthininaquaculture.

Keywords_ Pigment,Astaxanthin, fish, shellfish

I. INTRODUCTION

Manystudiesare done the effects of Astaxanthin oncolor pigments and survival rate of larvae in the world. For example, Astaxanthineffects on the growth and survival rateof Atlantic salmon fingerlings were examined and it was found, when not in use Astaxanthinonly 17 % of it to beliveand became adult fish. Researchers with increasing dietary Astaxanthin 0.4 (ppm) parts per million to 1 ppm, and at the end of experiment 7/13 ppm in the diet, concluded that the survival rate of fingerling fish has increased, so that the survival rate from 17 % to 87 % at a concentration of 1 ppmand 98 % at a concentration of 7/13 ppm Astaxanthin in the diet(Figure 1) [9].

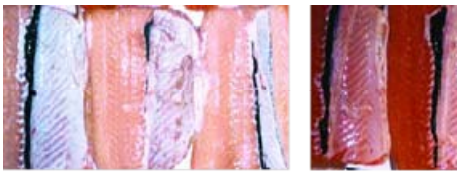

Fig. 1filletof salmonfedtheAstaxanthin(a),fillet of salmon fedinadequate Astaxanthin(b) [3].

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II. CHEMICALSTRUCTUREASTAXANTHIN

Astaxanthinisacolorfulpigment andfat-soluble. Astaxanthingenerally haveoxygen,Hydroxyl(OH)and/orketone(=O)groups.Sincemostof Astaxanthinwas obtained themetabolismof ZeaxanthinorCanthaxanthinhave aeither ketones orHydroxylgroups(Figure 2)[3].

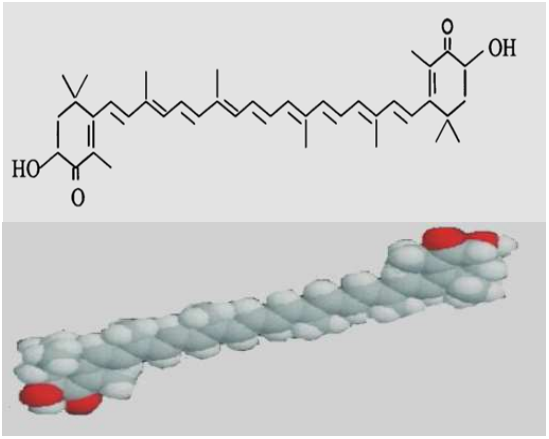

Fig. 2Spatial form of the molecule Astaxanthin.

Carotenoids are foundbothfree andesterifiedinanimals and plants, for exampleEuphausiaoilAstaxanthin isfound with formdiesterandAstaxanthinHaematococcus,with form monoester whereasPhaffiayeastAstaxanthinwith form free and non-esterifiesAstaxanthin. The freeandmonoester forms ofAstaxanthinareobserved more than diesterforms. Therefore is conceivedthatnon-esterifies free form of the Astaxanthinstoredin the body of major animals. Astaxanthin after entering thebody tocreateestershape beforeabsorptionin the intestineishydrolyzed[7].Intestingthe effectsof bothfree

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andesterified form of Astaxanthininthe dietoffishwere examined. The resultsshowed that theabsorption andcoloringesterifiedAstaxanthininfish skin is morethan freeAstaxanthin[1].

AstaxanthinSources: Astaxanthincan be found inmicroalgae, yeasts, Salmon, (*Abramisbrama)*, (*Carassiusauratusauratus)*, Krill, Shrimp, Cray fish and crustaceansandalso birds[6]. Pelagicfish don't haveAstaxanthinpigments, but benthic fish orgroundfloor fishareoftentohaveitpigment[2].In fact Astaxanthin, in food chain of aquatic natural environment, is biosynthesis by microalgae or phytoplankton as a first level of the food chain. the next phasephytoplankton are consumed by zooplankton, then insects and crustaceans eat the zooplankton and therefore Astagxantin stored in their body and eventually reach of other animals and fish [7].Examples Astaxanthinsources toproducecommercial diet consist of species:

1-*Euphausiapacifica*2-*Euphausiasuperb* 3-*Haematococcuspluvialis*4-*Pandalus borealis*5-*Phaffia rhozydima*…

Table1. Astaxanthin concentration in different source (ppm of dry biomass) [3].

Sources	Astaxanthin concentration (ppm of dry biomass)
Salmon fish	5~
Plankton	60~
Norway krill	120~
Arctic shrimp	1200~
Phaffiarhozydima	10000~
Haematococcuspluvialis	40000~

In general,theprimary sourcefor theproduction ofnaturalAstaxanthin, aremicroalgae of(*Haematococcuspluvialis*). It seems thatthesearethe highestlevelsAstaxanthininnature. This value isgenerally about40gramsAstaxanthinofakilogramdrybiomassalga[9].Althoug hwildPhaffia(Phaffia:is thetypically Yeast thatusedto extractAstaxanthin) have Astaxanthinbut theyhavenot affordable toproduceforindustrial partsbecausethey cannotproductionAstaxanthinexceed 300ppm ofdrybiomass, but thecommercial Phaffia variety haveabout 20 timesmore thanwildPhaffia.In a study on yeast*Phaffiarhozydima*the Astaxanthinamountwere reported about2000-4000 ppmas drybiomass. MoreAstaxanthinin this classify eastsisafree formthattheirabsorptionrate and coloringis lessthanestery formof consumerlivingtissue[3].

III. DIFFERENCE BETWEEN NATURAL AND SYNTHETIC ASTAXANTHIN

Syntheticforms ofcommercial andcarotenoidscan beCanthaxanthin(BB-Carotene-4, 4'-Dione),Astaxanthin(3, 3'-dihydroxy-B-carotene-4-4'-Dione)and di-palmitateAstaxanthinnoted.Artificial AstaxanthinandCanthaxanthinarecalled theredandpink chlorophyll. Although the common form of Astaxanthin for sale is the syntheticforms, but they can't applied for nutrition human because they made of experimentally in petrochemical industry and therefore used for animal consumption. Synthetic Astaxanthin has a higher than concentration of natural Astaxanthin(Synthetic form 8-10%, natural form 1.5-2%) but natural Astaxanthin has better function on colorful of fish and foods [9].

Animals thatconsumenaturalAstaxanthinarebetterin survival, reproductionand growthrate. Restrictions onthe use ofnaturalcarotenoidpigmentsisnot onlya shortage ofrawmaterial source, but alsoloweramounts ofthese pigmentsarelistedinthesourcesthereforenaturalcarotenoidisthe more difficult to achieve of syntheticcarotenoid. Anotheruselimitation ofnatural pigmentsis found othernaturally moleculesinshellfishand yeastwaste such aswater,ash andchitin[9].

Asmentioned,syntheticAstaxanthinisalmostallof commercial Astaxanthin in aquacultureindustryused.SyntheticAstaxanthincontains a mixture ofsteroisomers, but natural Astaxanthinhasbetter colorand texturelooksoffishthanthesyntheticpigment. This is one ofthe reasons thatthe consumerspreferthe natural varietyof thesyntheticAstaxanthin.SyntheticAstaxanthinis soldof$ 2,000perkgwhileAstaxanthinnatural productsare sold higher than$ 7,000perkg. Carotenoidpigmentscost about15-25% of the production offood of salmonwhilecarotenoidpigmentscomprisesa small partoftheaquaticfood(from 50 to 100ppm) [9].

IV. DISCUSSION AND CONCLUSION

Astaxanthinapplications: carotenoids such as alpha-carotene, beta-carotene, zeaxanthin,AstaxanthinandCryptoxanthinby enzymesdeoxygenizeinthe stomach and intestinescellsare beingdecomposedand to be formvitamin molecules for thisreasontocarotenoids called the active Aprovitamin. Carotenoidsare abletooxidizethemselves instead othermolecules[5].Astaxanthin stabilizedfree radicals such as O_1^2andO_2^3.At leastthree mechanismsforAstaxanthinreactionwithradicalspeciesareidentifying: 1. Radical addition 2.Transfer Electron to theradical3.CompressionAlilikhydrogen[6].

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Carbonyl carotenoids such asCanthaxanthinand Astaxanthin are the best protection against the harmful effects of free radicals in the cell compared with beta-carotene. Investigations showed higher Astaxanthinantioxidant activity than comparedlutein, alpha and beta-carotene is a result of the balance of ketones and enolAstaxanthinin asolvent (Fig 3). In other hand, in systems such as meat and fish products, the hydrophilic activity of beta-carotene is more Astaxanthin.Astaxanthinhas a better touch with hydro peroxide Therefore it has more effect of keeping structures of the lipidsfrom oxidation. Astaxanthin in suppressing only oxygen be effective [6].

Astaxanthinplay an important role in the treatment of eye disorders such as cataracts, preventing lipoprotein oxidation, treatment of cancer through suppressing free radicals [3].Also keep tissues against harmful effects of sun exposure, also participate in the regulation of immune systems such as in creased lymphocytes activity and macrophages maintenance [7]. A lot of research has showed that Astaxanthin plays an important role on treatment of Parkinson's, Alzheimer's, diabetes and cancer prevention [9].

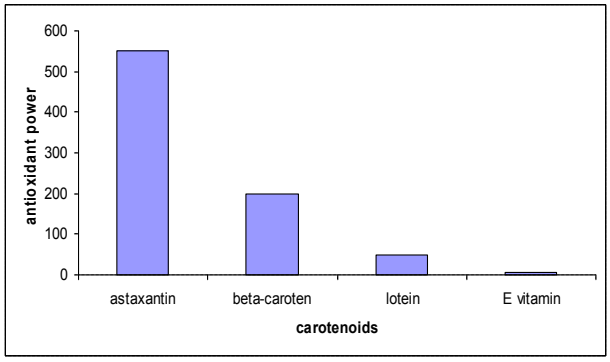

Fig. 3 Comparison of type's antioxidant power Carotenoids [8].

Aquatics animalssuch assalmons andshellfishesforvariety of theirbody'sactivities includingpry vitaminA,an antioxidant effect, as thehormones toimmune responses, grow, matureand reproduceareneed carotenoidpigmentsparticularlyAstaxanthin[7].Astaxanthinin makingfood fororнamental fishandfarmed fishsuch assalmonis used for skincolor,goodgrowth andsurvival rate of thesefish.In the absenceof Astaxanthinindietfarmedsalmonandrainbow trout (*Oncorhynchusmykiss*), theirmeat can be seen gray, as a resultfor consumers of fish were unfair andmarketing declined.Inmost countries, including some countries inEastand Southeast Asia, including Thailand, China, Indiaand someEuropean countriessuch asGermany,France, Belgium and HungaryAstaxanthinareusedtoanimal feed, livestock andaquacultureproduction [2].

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The role andimportance of themajororgans on osmoregulation in fish

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Abstract_Among the most important settings that fish must be apply in the specific environments, is salt and water balance. There are a few species that their internal salt concentration is close to their surroundings. Cells to survive in an environment need the specific concentrations of certain substances, such as dissolved ions in the water. Indoor fish's body must have needed a set of ionized salts, alkalinity and dissolved organic compounds, while the external environment has a set of several of these factors. Thus the possibility of balance concentration of ions in the blood and keep it in a certain concentration, is need to transfer one side of membrane to another side with control mechanisms. Until provide unification concentration of ions in the blood with fish living environment water.Lose of ion and vital molecule such as water or inter certain ion in blood and tissue of fish or increased their concentration in blood can to be threat for continue of fish life. This paper is discussed the performance of various organs involved in osmoregulation of fish.

Keywords- Osmoregulation, Balance, Ion, Fish

I. INTRODUCTION

Physiologically,thefish mustbe capableofabsorbingordissipatingexcessions andwaterto prevent.Control ofacid-base balancestatus-Insideis essentialforfishlife. Usually,the directexchange ofhydrogen withsodium ionsandchloridewithbicarbonateionsis causinganaccuratemodelof the acid – basebalance [3]. Inadultfish, organssuch as thegills, kidney, intestine andskinsomewhathave important role inthe absorptionand secretionof ionsand water and caused to createthe ionic and osmotic gradients between the body and the outside body of the fish [16].

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Osmoregulation in fish embryos and larvae are completely undeveloped, despite these fish embryos and larvae are able to generate osmotic and ionic gradients.Thus, fish embryos and larvae should have other organs to establish ionic equilibrium. In process that yet gills evolutions have not completed chloride cells often are sparse in the yolk sac and fetal membranes [8].

gills is One of the most important organs of bony fish that responsible for regulating ion , so that the mitochondria -rich cells (MRCs) have been identified as the primary location for exchanging ion is fish. Different models are purposed for adsorption and extraction of ions in each of freshwater fish and saltwater.Ions enable topass by active or inactive transmission through of the exchanger and ion channels such as Na-K-ATPase,-Na-K-2Cl and chlorine, sodium and calcium channels through the cell membrane. Many hormones such as prolactin and cortisol seem that control to pass the ions through the gill epithelium. Pickford and Phillips for the first time stated that prolactin is involved in osmoregulation of freshwater fish [20].

Lots of fish such as rainbow trout(*Oncorhynchusmykiss*)can live in both freshwater and saltwater environments and migration between the two environments. One of the most important adaptations in fish during migrationis needed morphological and molecular changes to build salt and water balance in the body. Salman and Eddy (1987) stated that rainbow trout fed a diet enriched with NaCl, mitochondria -rich cells and Na-K-ATPase activity is increased, this researchers also stated that obtain salt from food or fish transfer from fresh water to salt water can cause the same physiological responses . So change the gills of freshwater fish to saltwater phenotypes through natural migration of saline water is possible. So study different mechanisms involved in the absorption and extraction of ions in fish such as the gills, kidney, intestine, rectal gland and skin are necessary [22].

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II. ORGANS INVOLVED IN THE ABSORPTION AND EXTRCTION OF IONS

Gills:Gillsseparatedawiderangebetween the outside andinside ofthebody of the fish.Gillsarethe mainlocationsin passivemovementof saltsand water due toitslarge scaleandhighrelative permeability[4].

Path of passive flow is determined by the gills through Ionic and osmotic gradients.So the electro-chemical gradients in freshwater fish gill stimulates inactive salts extraction and water absorption, but insea water electro-chemical gradients is reverse and fishes faced with salt entrance and water loss.In freshwater fish Salt and water balances are achieved by excreting large amounts of urine and active absorption of sodium and chloride ions through the gills.Insaltwater fishosmoregulationoccurs bydrinkingwater,active excreteNaClthrough thegillsand reducedglomerular filtration rateto minimizewater lossthrough thekidneys.since freshwater fish Gills is designed to absorb NaCl in hypotonicenvironmentwhilesaltwaterfish's gillsis designedtoexcreteNaCl in hypertonicenvironment, successful migrationrequireschanging the structure ofgillsbetweentwogillphenotypesinfresh and saltwater[24].

Kidney: Bony fishKidney isMesonephricand includes the nephronsthat maybehaveglomerulus(freshwater and euryhalinespecies),little orabsolutelyno haverenalglomeruli (Aglomerulus).The lasttwoare foundinmarine fish. Infreshwater fish, the rapidglomerular filtration rateandurinary flow rateis highandto minimizeions extract, produced urine is extremelydilute.In marine specieswith aglomerulus and little glomeruluskidney amountof urineproductionis low andinboth cases, the excretionmaterials haverichdivalentisotonic ions(such as calcium, magnesium and sulfate).Themain purposeof allmarine fishappearsto excreteexcesspolyvalentelements that possibly have obtainedthroughintestinalabsorption[24].

Digestive system: The morphologyofstomach-intestinalamongdifferent fish speciesdependson variesfeedingstrategies. InMarine bony fish, stomach-intestinalpart has amajor roleinosmoregulationbydirectabsorption of waterto compensatewater losttheenvironmentishyperosmotic. Actinvoluntarilydrinking waterconstitutesthe initial stage, whilethe intestinalabsorption and extractionprocessestocompletethe processas exit rectalfluid[2].

Since fluid reabsorptiontakes place in stomach-intestinalpart, the rate of reabsorption and the rate flow of rectal fluid arecontrolled.Amount rectal fluid flow may be controlled by the rectum gland and anal sphincter. In addition to the direct role of stomach-intestinal part on osmoregulation of marine teleost, also digestive function plays a role in fish osmoregulation.The action digestion takes placeby absorption and excretion in all cases involving the transfer of electrolytes and digested food containing different concentrations electrolytes depending on the type of food. In addition, nutrition plays a role in water balance associated with the ingestion of water is directly absorbed and natural foods contained large amounts of water [10].

Skin andgillmembranes: In many species offish, gillsarebasicallythe only place totransportof body surface, but thecreatures thatskincellshave rich mitochondria, the skin cannot onlygas exchangein thesignificant, even ionexchangemayalso help. Thesecells have been reportedin theskin offishsuch asguppy (*Gillichthys mirabilis*)and (*Periophthalmusmodestus*)[17].In guppy fish, chloride cells in the skin covers almost the entire surface of body and about 5 -10 % of ion exchange takes place through the body surface. Studies have showed that guppy'sskin covered on the operculum has rich mitochondria of cells and the amount of ion exchange in this area is $10meq.L^{-1}.cm^{-1}.h^{-1}$.before gill cells evolution, Embryonic yolk sac epithelium of fish have rich of mitochondria as transport ion organacts in fetus of freshwater and saltwater fish. Inembryonic and larval stages that the gills are still undeveloped, chloride cells are sparse on the yolk sac and fetal membranes [6].

Studies have showed thatyolk sacmembraneof embryosandlarvae oftilapia*(Oreochromismossambicus)* there area large numberof chloridecells.Chloridecellssize wasincreasedintheembryoof thisspecies when transfer fromfreshwatertoseawater[2].In a studyonfetalyolk sac oftilapia*(Oreochromismossambicus)* located in freshwaterwas detected three chloride cell types: 1-chloridecells containsNa-K-ATPaseenzymeinfrombasolateralmembrane 2- chloridecells containsNa-K-ATPaseenzyme inform basolateralmembrane and$Na-K-2Cl^{-1}$protein in the apicalmembrane3-chloridecells containsNa-K-ATPaseenzyme inform basolateralmembrane and $Na-K-2Cl^{-1}$protein in the basolateralmembrane.But in embryosof this species insaltwaterwas seenNa-K-ATPaseenzyme and$Na-K-2Cl^{-1}$proteinin the basolateralmembrane andapicalmembranechloridechannel[7].

Urinary bladder: Urinary bladderoffreshwaterteleost fishactsas afinal locationfor theabsorptionof ions, sothat theurinemakes as much as possible hypotonic. Saltextractionthroughoutkidney will be minimized. Urinary bladderin euryhalineguppycontainsareasthatarehighlyactive on ion transportareinfluenced byprolactin.NaCluptakeinfreshwaterteleostoccursin theurinary bladder, but the epitheliumhas a higherosmoticpermeabilityascausingmorewaterreabsorptionand oftenurinary bladder was created calcium and magnesium hardness [13].

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III. CONCLUSION

It seems thatmany of the hormones controlthepassageof ionsthrough thegillepithelium thatare importantforosmoregulationprocess. Hormonaleffectsmay is includemorphological changesincell structure, stimulation orinhibition ofactivity iontransferprotein.

Prolactin hormone: Pickford and Phillips first time mentioned the prolactin importance toosmoregulation of freshwater fish [20],they showed that prolactin injection to*Fundulusheteroclitus*, they only would be able to live in fresh water.In a study prolactin hormone injected tobrown trout then it transferred to the salt water for 48 hours that increased the plasma concentration of magnesium ions, whereas injections of growth hormone decreases magnesium levels in plasma [25].Prolactin hypercalciumia effects have been reported in some teleost[24]. Prolactin levels in blood plasma inversely arerelated to salinity [26]. Tilapia and rainbow trout(*Oncorhynchusmykiss*)transferred hyperosmotic salinity, increasedexpressionprolactin receptor, which indicated that thesehormones may be involved in adaptation to salinity [23]. Pickford and Phillips stated that the injection prolactin inhibits Na-K-ATPase enzyme activity in freshwater fish (*Fundulusheteroclitus)* [20].Studies have showed thatthese hormonesalsoaffectthedensityand size ofchloridecells. For example,injectionsprolactin hormoneto tilapia*(Oreochromismossambicus)* thatsaltwateradapted significantlyreduced the size ofchloridecellsbutthedensity ofthese cellsremains without change[9]. In seawater, mitochondrion-rich cells are generally larger and contain a deep apical crypt, whereas in freshwater, there is a broad apical surface containing numerous microvilli. Growth hormone and cortisol can individually promote the differentiation of the seawater chloride cell, and also interact positively to control epithelial transport capacity. Prolactin inhibits the formation of seawater chloride cells and promotes the development of freshwater chloride cells. Cortisol also promotes acclimation to freshwater by maintaining ion transporters and chloride cells, and by interacting to some degree with prolactin PVC, pavement cell(Fig 1) [18].

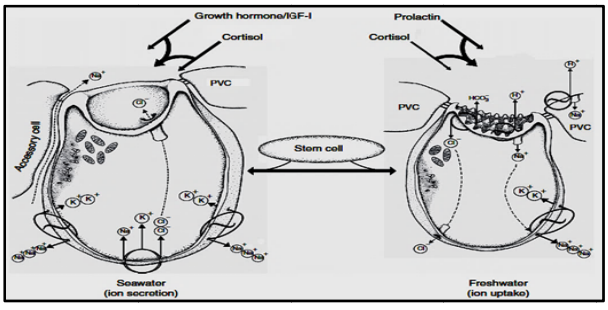

Fig -1.Morphology, transport mechanisms, and hormonal control of gill chloride cells in freshwater and seawater [18].

Cortisol:therole ofthis steroidhormoneis wellknown tosaltwaterfish osmoregulation, butevidence suggeststhat thishormoneis also involvedinosmoregulationoffreshwater fish. According topreliminary findingsindicatedthatcortisolinjectionstimulates Na-K-ATPaseenzyme activityin manyfishesas well asincreasedresistancetosalinity[14]. It iswellknownthat thishormoneincreased the Na-K-2Cl$^-$ [1]expressioningillsofAtlanticsalmonadaptedtofresh water[20].Based onphysiological studies, it can beexpected thattheplasmalevels of thesehormonesinadaptationtosalt waterrises,preliminary studiesonthistopicintilapiafish andAnguilla fishhas been determined.Butmany studieshave showed thatwhen manyfish speciessuch asAnguillafish, tilapia, mullet, sea bass when transported to waterwithlowsalinityorfresh waterplasmacortisol levelswere significantlyincreased. These findingssuggest thatcortisolplays an important roleonosmoregulationof freshwater fish [19]. In the gut during salt water acclimation, cortisol induces apoptosis and proliferating cells become localized in troughs of intestinal folds, resulting in the high permeability. During fresh water acclimation, prolactin stimulates cell proliferation synergistically with cortisol, and apoptosis becomes localized at their tips, resulting in low permeability. In the gill, coordinated changes in proliferation, differentiation, transformation and apoptosis result in increased ion uptake chloride cells in freshwater and increased salt secretory chloride cells in seawater. The GH/IGF-I and cortisol axes interact to increase salt secretory chloride cells, and prolactin and cortisol interact to increase ion uptake chloride cells, but the cell turnover pathways through which these hormones control gill chloride cells has not been examined(Fig 2) [21].

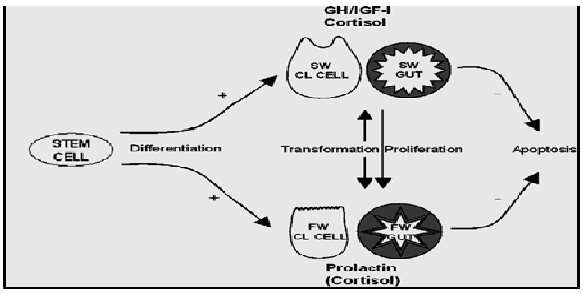

Fig - 2.Summary representation of the epithelial differentiation in the gill and gut of euryhalineteleosts during acclimation to different salinities [21].

Initialstudieshave showed thatinjectingcortisol hormoneintoadult Anguilla fishandfreshwater goldencarp (*Carassiusauratus*) stimulatesabsorption ofsodium and chlorineions.LinandRandallstated thatcortisolstimulated V-H-ATPaseenzyme activityintroutgills[12]. Increased surface

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ofchloridecellsassociated with increasedabsorptionof sodiumand chloridewith injection ofthese hormoneshave been identifiedonfourspeciessuch as freshwaterrainbow trout(*Oncorhynchusmykiss*), Europeaneel(*Anguilla anguilla*), tilapia and catfish(*Ictalurusnebulosus*)[11].In a studyby decreasingthe amountof watercalcium of culture rainbow troutfrom490to25mmolperliter,the plasmacortisol levelsincreased and alsodue to thestimulation oftheCa-ATPaseenzyme activity, increasedthe transmission capacityof calciumin thebasolateral membrane gills[5].

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